Our Greatest Mountain

A Handbook for Mount Rainier National Park

F. W. Schmoe

CALIFORNIA-WESTERN AMERICANA
R 917.97 S35
Schmoe, F.W.
Our greatest mountain.

R 917.97
Call No. S35
FORM 3 11-25-10M
CALIFORNIA-WESTERN AMERICANA
Santa Clara County Free Library

This book may be kept 14 days.

A fine of 5 cents per day will be charged on books kept overtime.

No books will be issued to persons in arrears for fines.

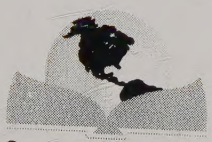
Books must not be loaned by the borrower.

Careful usage of books is expected, and any soiling, injury, or loss is to be paid for by the borrower.

Research Center MAR 21 1977

Santa Clara Coun
Free Library
San Jose, Calif.

CALIFORNIA - WESTERN AMERICAN



Santa Clara County
LIBRARY

Renewals:
(800) 471-0991
www.santaclaracountylib.org

5816

(Copyrighted by Norman Edson

Our Greatest Mountain

"A giant among giants, towering to an elevation of almost three miles above the waters of Puget Sound"

OUR GREATEST MOUNTAIN

A Handbook for Mount Rainier National Park

BY

F. W. SCHMOE, B.S.F.

Park Naturalist, National Park Service

With 64 Illustrations and a Map

Santa Clara County
Free Library
San Jose, Calif.

G. P. PUTNAM'S SONS

NEW YORK AND LONDON

The Knickerbocker Press

1925

SANTA CLARA COUNTY LIBRARY

3 3305 00248 1517

Copyright, 1925
by
F. W. Schmoe

Made in the United States of America

917.97
S35

Santa Clara County
Free Library
San Jose, Calif.

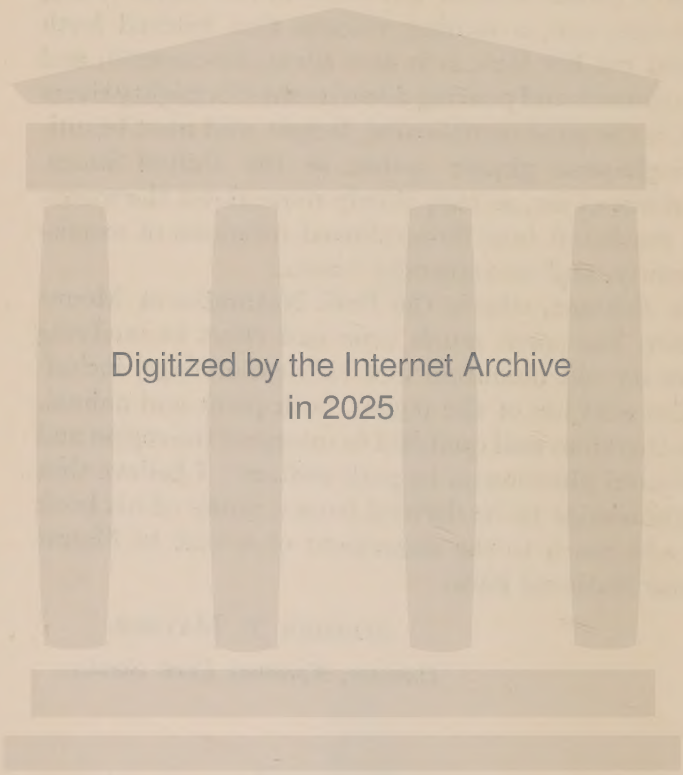
INTRODUCTION

LOFTY Mount Rainier is a study in contrasts. Once, many ages ago, a roaring volcano that belched forth fire and red-hot lava, it is now silent, ice-covered; and on its summit and pouring down its sides in mighty rivers of ice, is the most complicated, largest, and most beautiful single-peak glacier system in the United States. The rivers of ice, as they slowly move down the mountain, reach out into flower-dotted meadows of exquisite beauty, and into splendid forests.

Mr. Schmoe, who is the Park Naturalist at Mount Rainier, has spent much time and effort in studying the hoary old mountain and its surroundings, including the wild life of the region, both plant and animal. He is therefore well qualified to interpret the region and its natural phenomena to park visitors. I believe that the knowledge to be derived from a study of his book will add much to the enjoyment of a visit to Mount Rainier National Park.

STEPHEN T. MATHER,
Director, National Park Service.

100072



Digitized by the Internet Archive
in 2025

https://archive.org/details/ourgreatestmount0000fwsc

PREFACE

MOUNT RAINIER NATIONAL PARK provides recreation and pleasure for many thousands of people each year. Aside from being a vast, scenic playground of superlative natural beauty it is literally a gigantic outdoor museum whose three hundred and twenty-four square miles of "floor space" are crowded with exhibits of great interest. It is to stimulate this interest and thus increase the pleasure of the visitor, as well as provide him with a guide book to the roads, trails, scenic features, and natural history of the region, that this book is offered.

Acknowledgment and sincere thanks are due to many people who have helped to make the volume possible. Credit has been given those who have so kindly supplied much of the material in the various chapters, but I wish here also to express appreciation for their contributions.

Special credit is due Mr. O. A. Tomlinson, Superintendent of Mount Rainier National Park, Mr. Stephen T. Mather, Director of the National Park Service, and Mr. Horace M. Albright, Field Assistant to the Director, for valuable assistance and encouragement, and to Mr. T. H. Martin, of the Rainier

National Park Company, and the Seattle Chamber of Commerce for supplying pictures for the illustrations.

F. W. SCHMOE,

Park Naturalist,
Mount Rainier National Park.

February 1, 1925.

CONTENTS

PAGE

INTRODUCTION—*By Stephen T. Mather* . . . iii

PREFACE v

BOOK I

THE MOUNTAIN

CHAPTER

I.—THE STORY OF THE MOUNTAIN . . . 3

II.—THE GLACIERS OF MOUNT RAINIER . . 10

III.—HUMAN HISTORY 50

BOOK II

THE NATIONAL PARK

IV.—DESCRIPTION AND ADMINISTRATION . . 87

V.—SCENIC FEATURES, ROADS, AND TRAILS . . 91

BOOK III

FLORA AND FAUNA

VI.—LIFE ZONES ON MOUNT RAINIER . . . 129

VII.—FLOWERS OF THE NATIONAL PARK . . . 135

VIII.—FERNS OF MOUNT RAINIER NATIONAL PARK 192

IX.—THE FORESTS OF MOUNT RAINIER NATIONAL PARK 199

CHAPTER PAGE

X.—Animals of the Park 231

XI.—Birds of the Park Region 267

XII.—The Fishes of the Park 329

BOOK IV

WINTER ON THE MOUNTAIN

XIII.—The Winter Season 343

Index 355

ILLUSTRATIONS

	FACING PAGE
Our Greatest Mountain	*Frontispiece*
The Rugged West Side	6
Lone Pine Vista	10
An Impending Avalanche	18
Where Flowers and Glaciers Meet	18
The North-East Side and the Emmons Glacier	32
An Ice Cave	32
The Cirque of the Carbon Glacier	36
Beautiful Mowich Lake	46
Yakima Chieftain	80
Makah Basket Carrier	81
Sketch Map of Mount Rainier National Park	88
Natural Bridge	98
Storm on the Mountain	98
Climbing in Sunset Park	102
Mirror Lake	104
Summit Party Crossing a Crevasse	106

FACING PAGE

Camp Muir 110

A Difficult Bit of Rock Work 112

Life Zones on Mount Rainier 132

Avalanche Lilies Growing Through the Snow . 138

A Field of Avalanche Lilies 138

White Heather 140

A Field of Indian Basket Grass 140

Blue Gentians 140

Pentstemons 140

Avalanche Lily 144

Western Anemone 144

Purple Aster 144

Giant Hellebore 144

Elephant's Trunk Lousewort 146

Duck's Bill Lousewort 146

Indian Pipes 146

Canada Dogwood 146

The Forest Floor Carpeted with Ferns . . 196

The Castle and Pinnacle Peak 202

The Storm Swept Sentinel 204

Douglas Fir 208

FACING PAGE

Alaska Yellow Cedar 209

Giant Firs and Hemlocks Along the Nisqually Road 212

Columbia Black-Tailed Deer. Buck and Doe . 234

Wapiti or Elk 236

White Mountain Goat 237

Black Bear 238

Coyote Tracks 242

Hoary Marmot or Whistler 244

Rock Rabbit or Cony 256

Chipmunk 256

The Varying Hare or Snowshoe Rabbit. Winter, Spring, and Summer Color Phases . . . 258

Ptarmigan 278

Mother Ptarmigan with Chicks 278

Sooty Grouse 278

Steller Jay. Water Ouzel or Dipper . . 298

The Gray Jay or Camp Robber 302

Nutcracker or Clark Crow 302

Flower-Fringed Reflection Lake . . . 330

Four Species of Trout Common in Park Waters 336

Paradise Inn and the Tatoosh Range—Winter 344

FACING PAGE

PARADISE INN AND THE TATOOSH RANGE—SUMMER 345

A TEAM OF ESKIMO HUSKIES ON A TRAIL IN AN ALPINE PARK 346

ON A WINTER TRAIL 347

SKI JUMPING ON JULY 4TH 348

A TOBOGGAN SLIDE ON EAGLE PEAK 349

WHERE WINTER REIGNS 352

OUR GREATEST MOUNTAIN

BOOK I

THE MOUNTAIN

CHAPTER I

The Story of the Mountain

On the Cascade Range, which extends northward from California through Oregon and Washington to the Canadian boundary, stands a series of great snow-clad volcanoes. For ages they, like warrior chiefs, kindled great council fires that blazed across the world as tokens of their greatness. Though a more peaceful band at present, these mighty sachems still hold sway, and in some the challenging fires still smoulder. Plumed with clouds and robed in eternal snow, they stand proudly erect, dominating the lesser peaks that cluster about their feet.

Best known are Mount Shasta, in California (14,162 feet); Mount Hood, in Oregon (11,225 feet); Mount St. Helens (9,697 feet), Mount Adams (12,307 feet), Mount Baker (10,730 feet), and Mount Rainier (14,408 feet), in the state of Washington.

Supreme in this stalwart band is Mount Rainier, a giant among giants, towering head and shoulders above its brothers, rising abruptly from tide-water in Puget Sound, which is only forty miles distant, to an elevation of nearly three miles.

Almost 250 feet higher than Mount Shasta, its nearest rival in mass and in grandeur, it is overwhelmingly impressive, both by the vastness of its glacial mantle and by the

striking sculpture of its cliffs. The total area of its glaciers amounts to no less than 45 square miles, an expanse of ice far exceeding that of any other single peak in the United States. Many of its individual streams of ice are between 4 and 6 miles in length and vie in magnitude and in splendor with the most boasted glaciers of the Alps. Cascading from the summit in all directions, they radiate like the arms of a great star-fish. All reach down to the foot of the mountain and some advance considerably beyond it.

As for the plea that these glaciers lie in a scarcely opened, out-of-the-way region, a forbidding wilderness as compared with maturely civilized Switzerland, it no longer has the force it once possessed. Rainier's ice fields can now be reached from Seattle or Tacoma, the two principal cities of western Washington, in a few hours' journeying, either by rail or by automobile. The cooling sight of crevassed glaciers and the exhilarating, flower-scented air of alpine meadows need no longer be exclusive pleasures, to be gained only by a trip abroad.

Mount Rainier stands on the western edge of the Cascade Range, overlooking the lowlands that stretch to Puget Sound. Seen from Seattle or Tacoma, 60 and 50 miles distant, respectively, it appears to rise directly from sea level, so insignificant seem the ridges about its base. Yet these ridges themselves are of no mean height. They rise 3,000 to 4,000 feet above the valleys that cut through them, and their crests average 6,000 feet in altitude. Thus at the southwest entrance of the park, in the Nisqually Valley, the elevation above sea level, as determined by accurate spirit leveling, is 2,003 feet, while Mount Wow (Goat Mountain), immediately to the north, rises to an altitude of 6,045 feet. But so colossal are the proportions of the great volcano that they dwarf even mountains of this size and give them the appearance of mere foothills.

From the top of the volcano one fairly looks down upon the Tatoosh Range, to the south; upon Mount Wow, to the southwest; upon the Mother Mountains, to the northwest, indeed, upon all the ridges of the Cascade Range.

Only Mount Adams, Mount St. Helens, and Mount Hood loom like solitary peaks above the even sky line, while the ridges below this line seem to melt together in one vast, continuous mountain platform. And such a platform, indeed, the Cascade Range was once upon a time. Now it is deeply cut by many ramifying valleys, and resolved into a sea of wave-like crests and peaks.

Mount Rainier stands, in round numbers, 10,000 feet high above its immediate base, and covers 100 square miles of territory, or one-third of the area of Mount Rainier National Park. In shape it is not a simple cone tapering to a slender, pointed summit like Fujiyama, the great volcano of Japan. It is, rather, a broadly truncated mass resembling an enormous tree stump with spreading roots and irregularly broken top. Its life history has been a varied one. Like all volcanic cones, Rainier has been built up from the materials ejected by successive eruptions —from cinders and bombs (steam-shredded particles and lumps of lava), and occasional flows of liquid lava that have solidified into layers of hard, basaltic rock. At one time it attained an altitude of not less than 16,000 feet, if one may judge by the steep inclination of the layers of lava and cinders visible in its flanks. Then a great explosion or series of explosions carried away the top of the mountain, and reduced it about 2,000 feet in height. The volcano was thus beheaded and left with a capacious hollow crater, surrounded by a jagged rim.

Later this great cavity, which measures nearly 2 miles across, was filled by two small cinder cones. Successive feeble eruptions added to their height until at last they formed together a low, rounded dome—the eminence which now constitutes the main summit. It rises only about 400 feet above the rim of the old crater and is a relatively inconspicuous feature, not readily identifiable from all sides as the highest point. In fact, so broad is the mountain's crown that from no point at its immediate base is the central summit visible. The higher parts of the old crater rim rise to within a few hundred feet of the level of the sum-

mit, and stand out boldly as separate peaks that mask and seem to overshadow the central dome. Especially prominent are Point Success (14,150 feet) on the southwest side, and Liberty Cap (14,112 feet) on the northwest side.

The altitude of the main summit was for many years in doubt. Several figures had been announced from time to time, no two of them in agreement; but all of these, it is to be observed, were obtained by more or less approximate methods. In 1910 and 1913 the United States Geological Survey, in the course of its topographic surveys of the Mount Rainier National Park, made a new series of measurements by triangulation at close range. These give the peak an altitude of 14,408 feet, thus placing it near the top of the list of high summits in the United States. This last figure, it should be added, is not likely to be in error by more than a foot or two and may with some confidence be regarded as final. Greater exactness of determination is scarcely to be expected in the case of Mount Rainier, as its highest summit consists actually of a mound of snow which naturally varies somewhat in height with the seasons and from year to year.

This crowning mound of snow, which was once supposed to be the highest point in the United States, still bears the proud name of Columbia Crest. It is essentially a huge drift or dune of snow, heaped up by the westerly winds, which drive furiously up through the great breach in the western flank of the mountain, between Point Success and Liberty Cap, and eddy lightly as they shoot over the summit and there deposit their load of snow.

The mound is situated at the point where the rims of the two summit craters touch, and represents the only permanent snow mass on these rims, for the internal heat of the volcano still suffices to keep these rock-crowned ridges bare of snow the better part of the year. It is intense enough, even, to produce numerous steam jets along the edges of both craters. These depressions, however, are filled with snow, so that they have the appearance of shal-

(Photograph by Ranapar Studio)

The Rugged West Side

From Sunset Park a splendid view of the broken down rim of the crater is seen with Columbia Crest beyond

low, white-floored bowls 1,000 to 1,200 feet in diameter. Great caverns are melted out by the steam jets under the edges of the snow, and these caverns afford shelters which, though uninviting, are not to be despised. They have proved a blessing to more than one party that has found itself compelled to remain over night on the summit, saving them from death in the icy gales.

That Mount Rainier should retain so much of its internal heat is not surprising in view of the recency of its eruptions. It is known to have been active at intervals during the last century, and actual record exists of feeble eruptions in 1843, 1854, 1858, and 1870. Indian legends mention a great cataclysmal outburst at an earlier period.

At present the volcano may be regarded as dormant and no apprehension need be felt as to the possibility of an early renewal of its activity. The steam jets in the summit craters, it is true, as well as the hot springs at the foot of the mountain (Longmire Springs and Ohanapecosh Hot Springs), attest the continued presence of subterranean fires, but they are only feeble evidences as compared with the geysers, the steam jets, and boiling springs of the Yellowstone National Park. Yet that region is not considered any less safe to visit because of the presence of these thermal phenomena.

In spite of Mount Rainier's continued activity until within the memory of man, its sides appear to have been ice-clad for a great length of time. Indeed, so vigorous and so long-continued has been the eroding action of the glaciers that the cone is now deeply scarred and furrowed. Most of its outer layers are stripped away; only here and there do portions of them remain in the form of sharp crags and ridges that afford some indication of the original dimensions of the cone. Though mere details in the volcano's sculpture, some of these residual masses nevertheless are so tall that, were they standing by themselves, they would be imposing peaks. Particularly noteworthy is Little Tahoma, a sharp, triangular tooth on the east flank, that reaches an altitude of 11,117 feet. In its steep, ice-carved

walls are visible steeply dipping volcanic strata aggregating 2,000 feet in thickness, and pointing upward to the place of their origin, the former top of the mountain, which rose almost half a mile higher than the present top.

Nor is the greater crater rim left by the explosion that destroyed the original top preserved in its entirety. Point Success and Liberty Cap are the only two promontories that give trustworthy indication of its former height and strength. Probably they represent the more massive portions on the southwest and northwest sides, respectively; the weaker portions to the east and south have long since been worn away by the overriding ice cascades. Only a few crags remain upon which the ice cascades split in their descent. The most prominent, as well as the most interesting, is the one on the southeast side, popularly known as Gibraltar Rock. Really a narrow, wedge-shaped mass, it appears in profile like a massive, square-cut promontory. The trail to the summit of the mountain passes along its overhanging south face and ascends by a precipitous chute between ice and rock. This is the most difficult part of the ascent.

From the rim crags downward, the icy covering of the cone divides into a number of distinct stream-like glaciers, each sunk in a great hollow pathway of its own. Between the ice-filled trenches the uneroded portions of the cone stand out in high relief, either as sharp ribs or as huge triangular "wedges" that head at the sharp rim crags and spread broadly toward the mountain's base. There the divides between the glacier canyons assume the form of gently sloping tablelands that bear charming alpine meadows dotted with clumps of fir and hemlock, and occasional mirror ponds. Paradise Park, Indian Henry's Hunting Ground, and Spray Park are the best known of these picturesque natural gardens. The profound ice-cut canyons themselves widen downward, beyond the ends of the glaciers, into broad, forested valleys, each traversed by a boisterous river. No less than a dozen of these ice-fed

torrents radiate from the volcano in all directions, and numerous lesser streams course from the snow fields between the glaciers.[1]

[1] From "Mount Rainier and Its Glaciers," by F. E. Matthes. Government Printing Office, 1922. Reprinted by permission of the author and the Department of the Interior.

CHAPTER II

The Glaciers of Mount Rainier[1]

The impression still prevails in many quarters that true glaciers, such as are found in the Swiss Alps, do not exist within the confines of the United States, and that to behold one of these rare scenic features one must go to Switzerland, or else to the less accessible Canadian Rockies or the inhospitable coast of Alaska. As a matter of fact, permanent bodies of snow and ice, large enough to deserve the name of glaciers, occur on many of our western mountain chains, notably in the Rocky Mountains, where a national reservation—Glacier National Park—is named for its ice fields; in the Sierra Nevada of California, and farther north, in the Cascade Range. It is on the last-named mountain chain, especially, that glaciers abound, clustering mainly in groups about the huge, extinct volcanoes that tower high above its sky line.

Of these volcanoes Mount Rainier bears by far the largest glacier system, both because of its great height and bulk, and because of its position in a region of

[1] The material for this chapter was taken from a booklet by F. E. Matthes issued by the Department of the Interior under the title "Mount Rainier and Its Glaciers." It is used here with the consent of the Department of the Interior and of the author, who has revised the text, adding several pages. François Emile Matthes is one of the leading geologists of the country. Since 1896 he has been connected with the United States Geological Survey. He has studied the glaciers of the mountain as has no other man.

(Copyrighted by Ranapar Studios)

Lone Pine Vista

Mount Rainier as seen from the Tatoosh Range to the south. The white-barked pine which frames the view and the alpine firs below are typical timberline trees

exceptionally great snowfall. Indeed, Mount Rainier may be said to stand in the snowiest corner of the United States. The westerly winds that blow in upon the Puget Sound region, especially in winter, carry a superabundance of moisture, and this moisture, as it strikes the chilling mountains—the Olympic Range and the Cascade Range—is condensed and precipitated in the form of snow. The great cone of Mount Rainier naturally intercepts a much larger amount than any adjoining mountain area of equal extent and, because of its frigidity, conserves the snows much longer.

The glacial mantle of Mount Rainier is composed of twenty-seven glaciers and a number of permanent fields of snow and ice. These, however, do not all radiate from a central snow cap on the crown. There is no such cap, although the crown is broad enough to carry one, and only six glaciers have their sources in the summit snows. These are the Nisqually, Ingraham-Cowlitz, Emmons, Winthrop, Tahoma, and Kautz. All the other ice bodies originate independently on the flanks of the peak, some at levels several thousand feet below the top. Yet among these are some of the largest and most beautiful ice streams, notably the Carbon, North Mowich, South Mowich, Puyallup, and South Tahoma glaciers.

The eleven glaciers named constitute what may properly be termed the primary glaciers. They are veritable rivers of crevassed ice, half a mile to more than a mile in width and several hundred to a full thousand feet in depth, that flow, with incredible slowness, yet with almost irresistible force, down the canyon-like channels which they have gouged into the sides of the mountain. Between them, cascading irregularly over the inequalities of the less deeply eroded parts of the cone, lie the secondary glaciers, of which

Inter Glacier, situated on The Wedge between the Emmons and Winthrop glaciers, is the prototype. Among them are the Paradise Glacier, particularly well known to visitors, and the Ohanapecosh, Frying-pan, Russell, Flett, Edmunds, Pyramid, and Van Trump glaciers.

Impressive though this vast aggregate of ice bodies on Mount Rainier may be, it is to be borne in mind that they are but the surviving remnants of glaciers of immensely greater size that once filled the valleys of the Cascade Range. By following the ridges of rock waste, or moraines, which these ancient glaciers of the Ice Age built up along their margins, one may trace their extent all the way to the foothills of the range, where they joined the broad ice sea which filled the basin of Puget Sound. The resplendent armor of Mount Rainier, which today contrasts so strikingly with the somber garment of forest that clothes the ridges about its base, is therefore but a reminder of those frigid days when the entire Cascade Range as well as the lowlands along its front were completely enshrouded in white.

Nisqually Glacier

The first glacier one meets on approaching the mountain from Longmire Springs lies in the upper end of the Nisqually Valley. The automobile road, which up to this point follows the west side of the valley, winding in loops and curves along the heavily wooded mountain flank, here ventures out upon the rough boulder bed of the Nisqually River and crosses the foaming torrent on a picturesque bridge. Some fifteen hundred feet above this structure, blocking the valley to a height of about 400 feet, looms a huge, shapeless pile of what

at first seems only rock waste, gray and chocolate-hued. It is the débris-laden end of one of the largest glaciers—the Nisqually. From a yawning cave in its front issues the Nisqually River, a good-sized stream from the start.

The altitude here, it should be noted, is about 4,000 feet (elevation of bridge is 3,908 feet); hence the ice in view lies more than 10,000 feet below the summit of the mountain, the place of its origin. And in this statement is strikingly summed up the whole nature and economy of a glacier such as the Nisqually.

A glacier is not a mere stationary blanket of snow and ice that clings inert to the mountain flank. It is a slowly moving stream-like body that descends by virtue of its own weight. The upper parts every winter are replenished by fresh snows, which at those high altitudes do not entirely melt away in summer; while the lower end, projecting as it does below the snow line, loses annually more by melting than it receives by precipitation, and is sustained largely by the continued accession of ice masses descending from above. The rate at which the ice moves forward has been determined by Prof. J. N. Le Conte, of the University of California. In 1903 he placed a row of stakes across the glacier, and with the aid of surveying instruments measured accurately the distances through which they advanced from day to day. He found that in summer, when the movement is greatest, it averages 16 inches per day. This figure, however, applies only to the central portion of the glacier—the main current, so to speak—for the margins necessarily move more slowly, being retarded by friction.

The foot of the Nisqually Glacier, then, although it seems stationary and fixed in place, is composed really of slowly advancing ice, but so rapid is the melt-

ing at this low altitude that it effectually counterbalances the advance. Actually, the ice front is subject to slight oscillations, backward and forward, for, as may be readily imagined, fluctuations in snowfall and in temperature, above or below the normal, throw the balance one way or another from year to year, or even month to month.

A glacier, however, also makes advances or retreats on a larger scale in obedience to climatic changes extending over periods of many years. Thus all the glaciers on Mount Rainier, as well as many in other parts of the world, are at present, and have been for some time, steadily retreating as the result of milder climate or of a lessening in snow supply. Only so recently as 1885 the Nisqually Glacier reached down to the place now occupied by the bridge, and it is safe to say that at that time no engineer would have had the daring to plan the road as it is now laid. In the last 35 years, however, the Nisqually Glacier has retreated fully 1,500 feet.

Evidences of similar recession are to be observed at the ends of the other glaciers of Mount Rainier, but the measure of their retreat is not recorded with the precision that was possible in the case of the Nisqually Glacier.

As one continues the ascent by the automobile road, a part of the glacier's lower course comes into view, and one gains some idea of its stream-like character. Particularly satisfying is the view from the edge of Paradise Park. Here several miles of the ice stream (its total length is nearly 5 miles) lie stretched out at one's feet, while looking up toward the mountain one beholds the tributary ice fields and ice streams pouring into it, as it were, from above, from right and left, all rent by innumerable crevasses, and resembling

foaming cascades suddenly crystallized in place. The turmoil of these upper branches is perhaps too confusing to be studied with profit, but the more placid lower course presents a favorable field for observation, and a readily accessible one at that.

A veritable frozen river it seems, flowing between smooth, parallel banks, half a mile apart. Its surface, in contrast to the glistening ice cascades above, has the grayish tint of old ice, relieved here and there by bright patches of last winter's snow. These lie for the most part in the gaping fissures or crevasses that run across the glacier at short intervals and divide its body into narrow slices. In the upper course, where the glacier overrides many obstacles in its bed, the crevasses are particularly numerous and irregularly spaced, sometimes occurring in two sets intersecting at right angles, and cutting the ice into huge square prisms. Farther down the current of the ice stream is more sluggish and the crevasses heal up by degrees, producing a united surface, over which one may travel freely.

Gradually, also, the glacier becomes covered with débris. Angular rock fragments, large and small, and quantities of dust, derived from the bordering rock walls, litter its surface and hide the color of the ice. At first only a narrow ridge of such material—a moraine, as it is called—borders the ice river on each side, resembling a sharp-crested embankment built by human hands to restrain its floods; but toward the lower end of the glacier, as the ice wastes away, the débris contained in it is released in large quantities and forms ever broadening marginal bands. In fact, from here on down it becomes difficult to tell where the ice of the glacier ends at the sides and where the moraines begin.

The lower part of the glacier, further, possesses a peculiar feature in the form of a débris ridge situated about

midway on its back—a medial moraine. Like a dark stripe or ribbon, it extends in smooth curves, gradually narrowing upstream. It may be traced all the way to its point of origin, the junction of the two main branches of the glacier, at the foot of a sharp rock spur on the mountain's flank.

In the last mile of the Nisqually's course, this medial moraine develops from a mere dirt band to a conspicuous embankment, that projects 40 feet above the ice. Not the entire body of the ridge, however, is made up of rock waste. The feature owes its elevation chiefly to the protective influence of the débris on its surface, which is thick enough to shield the ice beneath from the hot rays of the sun, and greatly retards melting, whereas the adjoining unprotected ice surfaces are rapidly reduced.

A short distance above the glacier's terminus the medial moraine and the ever-broadening marginal bands at last merge together. No more clear ice remains exposed, irregular mounds and ridges of débris cover the entire surface of the glacier, and the moraine-smothered mass assumes the peculiar inchoate appearance that is so striking upon first view.

In utter contrast to the glacier's dying lower end are the bright snow fields on the summit in which it commences its career. Hard by the rock rim of the east summit crater the snows begin, enwrapping in an even, immaculate layer the smooth sides of the cinder cone. Only a few feet deep at first, they thicken downward by degrees until, a thousand feet below the crater, they possess sufficient depth and weight to acquire movement. Occasional angular crevasses here interrupt the slope and force the summit-bound traveler to make wearying detours.

Looking down into a gash of this sort one beholds

nothing but clean snow, piled in many layers. Only a faint blue tinges the crevasse walls, darkening but slowly with the depth, in contrast to the intense indigo hue that is characteristic of the partings in the lower course of the glacier. There the material is a dense ice, more or less crystalline in texture; here it is scarcely more than snow, but slightly compacted and loosely granular—what is generally designated by the Swiss term "névé."

For several thousand feet down, as far as the 10,000-foot level, in fact, the snow retains this granular consistency. One reason for the slowness with which it compacts is found in the low temperatures that prevail at high altitudes and preclude any considerable melting. The air itself seldom rises above the freezing point, even in the middle of the day, and as a consequence the snow never becomes soft and mushy, as it does at lower levels.

It is not to be supposed, however, that the frigid upper névés suffer no loss whatever by melting. The heat radiated directly to them by the sun is capable of doing considerable damage, even while the air remains below the freezing point. At these high altitudes the heat of the sun is astonishingly intense, as more than one uninitiated mountain climber has learned to his sorrow by neglecting to take the customary precaution of "painting" his face before making the ascent. In a few hours the skin is literally scorched and begins to blister painfully.

At the foot of the mountain the sun heat is relatively feeble, for much of it is absorbed by the dust and vapor in the lower layers of the atmosphere, but on the summit, which projects two miles higher, the air is thin and pure, and lets the rays pass through but little diminished in strength.

The manner in which the radiant heat of the sun affects the snow is peculiar and distinctive. Instead of reducing the surface evenly, it melts out many close-set cups and hollows, a foot or more in diameter and separated by sharp spires and crests. No water is visible anywhere, either in rills or pools, evaporation keeping pace with the reduction. If the sun's action is permitted to continue uninterrupted for many days, as may happen in a hot, dry summer, these snow cups deepen by degrees, until at length they assume the aspect of gigantic bee cells, several feet in depth. Snow fields thus honeycombed are often met with on the slopes above Gibraltar Rock. They are wearisome to traverse, for the ridges and spines are firm, so that one is obliged laboriously to clamber over them. Most exasperating is the going after a snowstorm has filled the honeycombs. Then the traveler, waist deep in mealy snow, can only stumble haphazard through the hidden labyrinth.

Of interest in this connection is the great snow castle immediately to the west of Gibraltar Rock. Viewed from the foot of that promontory, the sky line of the snow castle fairly bristles with honeycomb spines; while below, in the face of the snow cliff, dark, wavy lines, roughly parallel to the upper surface, repeat its pattern in subdued form. They represent the honeycombs of previous seasons, now buried under many feet of snow, but still traceable by the dust that was imprisoned with them.

The snow cliff west of Gibraltar Rock is of interest also for other reasons. It is the end of a great snow cascade that descends from the rim of the old crater. Several such cascades may be seen on the south side of the mountain, separated by craggy remnants of the crater rim. Above them the summit névés extend in

(Photograph by Rounds)

An Impending Avalanche

Ice cliffs 300 feet high on the Nisqually Glacier to the west of Gibraltar Rock

(Copyrighted by Asahel Curtis)

Where Flowers and Glaciers Meet

The Canyon of the Nisqually Glacier. The moving ice has cut through more than 2,000 feet of old lava flows in carving this chasm

continuous fields, but below the rim, the slopes are too precipitous to permit a gradual descent, and the névés break into wild cascades and falls. Fully two to three thousand feet they tumble, assembling again in compact, sluggish ice fields on the gentler slopes below.

Of the three cascades that feed the Nisqually Glacier only the central one forms a continuous connection between the summit névés and the lower ice fields. The two others, viz., the one next to Gibraltar and the westernmost of the three, terminate in vertical cliffs, over great precipices of rock. From them snow masses detach at intervals and produce thundering avalanches that bound far out over the inclined ice fields below. Especially frequent are the falls from the cliff near Gibraltar. They occur sometimes hourly, but as a rule at periods of one or more days.

From the westernmost cascade avalanches are small and rare. Indeed, as one watches them take place at long intervals throughout a summer one cannot but doubt whether they are in themselves really sufficient to feed and maintain so extensive an ice field as lies stretched out below them. Surely much more snow must annually melt away from the broad surface of that field, exposed as it lies to the midday sun, than the insignificant avalanches can replace. Were they its only source of supply, the ice field, one feels confident, would soon cease to exist.

The fact is that the ice field in question is not dependent for its support wholly on avalanches. Though it receives some contributions from them, it is in reality an independent ice body, nourished chiefly by direct precipitation from the clouds and in part by wind-blown snow. And this is true, in large measure, of all the ice fields and glaciers that lie below the ice cascades. The Nisqually Glacier, accordingly, is to be regarded

Santa Clara
Free Library
San Jose

not as a product merely of the cascading névés, reunited and cemented together, but as an ice stream of a larger order originating at a lower level. Improbable though this may seem at first, it is nevertheless a fact readily explained.

The winter snows on Mount Rainier are heaviest in the vicinity of its base; indeed, the snowfall at those low levels is several times greater than on the summit. This in itself may seem anomalous. One would naturally suppose that the snowfall on high mountains increases with the altitude, and it seems surprising, therefore, to find a case in which the opposite is true. Yet Mount Rainier stands by no means alone in this regard. The Sierra Nevada and the Andes, the Himalayas and the Alps, all show closely analogous conditions.

In each of these lofty mountain regions the precipitation is known to be heaviest at moderate altitudes, and to decrease markedly toward the higher levels. The reason is that the heavy storm clouds which carry most of the rain and snow, hang in a zone of only moderate elevation, whereas higher up the atmosphere contains relatively little moisture and seldom forms clouds of any great density.

In the Rainier region the height of the storm clouds is regulated in large measure by the height of the Cascade Range; for it is really this cooling mountain barrier that compels the moisture-laden winds from the Pacific Ocean to condense and to discharge. It follows that the storm clouds are seldom much elevated above the sky line of the Cascade Mountains; they cling, so to speak, to its crests and ridges, while the cone of Mount Rainier towers high above them into serener skies. Many a day one may look down from the summit, or even from a halfway point, such as

Camp Muir (10,062 feet), upon the upper surface of the clouds. Like a layer of fleecy cotton they appear, smothering the lower mountains and enveloping the volcano's base.

Clouds, it is true, are frequently seen gathering about the mountain's crown, usually in the form of a circular cap or hood, precursor of a general storm, but such clouds yield but very little snow.

At Longmire Springs, the snow often reaches a depth of 7 feet, and the total snowfall in winter may exceed 20 feet in depth. The summer heat at this low level (2,762 feet) is, of course, abundantly able to remove all of it, at least by the end of May. But higher up every thousand feet of elevation suffices to prolong appreciably the life of the snowy cover. In Paradise Park, for instance, at altitudes between 5,000 and 6,000 feet, huge snowdrifts encumber the flowering meadows until far into July. Above an altitude of 6,000 feet permanent drifts and snow fields survive in certain favored spots, while at the 7,000-foot level the snow line, properly speaking, is reached. Above this line considerable snow remains regularly from one winter to the next, and extensive ice fields and glaciers exist without any protection from the sun.

It is between the 8,000 and 10,000 foot levels, however, that one meets with the conditions most favorable for the development of glaciers. Below this zone the summer heat largely offsets the heavy precipitation, while above it the snowfall itself is relatively scant. Within the zone the annual addition of snow to the ice fields is greater than anywhere else on Mount Rainier. The result is manifest in the arrangement and distribution of the glaciers on the cone. By far the greater number originate in the vicinity of the 10,000-foot level, while those ice streams which cascade from

the summit, such as the Nisqually, are in a sense reborn some 4,000 feet lower down.

Paradise Glacier

A striking example of an ice body nourished wholly by the snows that fall on the lower slopes of Mount Rainier is the Paradise Glacier. In nowise connected with the summit névés, it makes its start at an elevation of less than 9,000 feet. Situated on the spreading slope between the diverging canyons of the Nisqually on the west and the Cowlitz on the northeast, it constitutes a typical "interglacier," as intermediate ice bodies of this kind are termed.

Its appearance is that of a gently undulating ice field, crevassed only toward its lower edge and remarkably clean throughout. No débris-shedding cliffs rise anywhere along its borders, and this fact, no doubt, largely explains its freedom from morainal accumulations.

The absence of cliffs also implies a lack of protecting shade. Practically the entire expanse of the glacier lies exposed to the full glare of the sun. As a consequence its losses by melting are very heavy, and a single hot summer may visibly diminish the glacier's bulk. Nevertheless it seems to hold its own as well as any other glacier on Mount Rainier, and this ability to recuperate finds its explanation in the exceeding abundance of fresh snows that replenish it every winter.

The Paradise Glacier, however, is not the product wholly of direct precipitation from the clouds. Much of its mass is supplied by the wind, accumulating in the lee of the high ridge to the west, over which the route to Camp Muir and Gibraltar Rock is laid. The westerly gales keep this ridge almost bare of snow,

permitting only a few drifts to lodge in sheltered depressions. But east of the ridge there are great eddies in which the snow forms long, smooth slopes that descend several hundred feet to the main body of the glacier. These slopes are particularly inviting to visitors for the delightful "glissades" which they afford. Sitting down on the firm snow at the head of such a slope, one may indulge in an exhilarating glide of amazing swiftness, landing at last safely on the level snows beneath.

The general absence of crevasses is accounted for largely by the evenness of the glacier's bed and by its hollow shape, owing to which the snows press inward from all sides and compact the mass in the center. Only toward the frontal margin, where the glacier plunges over an abrupt rock step, as well as in the hump of that part known as Stevens Glacier, is the ice rent by long crevasses and broken into narrow blades. Here the inexperienced should not venture without a competent guide, for the footing is likely to be treacherous, and jumping over crevasses or crossing them by frail snow bridges are feats never accomplished without risk.

In the early part of summer the Paradise Glacier has the appearance of a vast, unbroken snow field, blazing, immaculate, in the sun. But later, as the fresh snows melt away from its surface, grayish patches of old crystalline ice develop in places, more especially towards the glacier's lower margin. Day by day these patches expand, until, by the end of August, most of the lower ice field has been stripped of its brilliant covering. Its countenance, once bright and serene, now assumes a grim expression and becomes criss-crossed by a thousand seams, like the visage of an aged man.

Over this roughened surface trickle countless tiny rills that unite to form swift rivulets and even torrents, —veritable river systems on a miniature scale that testify vividly to the rapidity with which the sun consumes the snow. Strangely capricious in course are these streamlets, for, though gravitating in the main down the glacier's slope, they are caught every few yards by a crevice or seam in the ice and deflected into a new direction. These seams are the scars of former crevasses that have healed under pressure in the course of the glacier's slow descent. As a rule they inclose a small amount of dirt, and therefore are particularly susceptible to melting. Along them the streamlets rapidly intrench themselves—by virtue of their warmth, what little there is of it, as much as by their abrasive action—and hollow out channels of a freakish sort, here straight and canal-like, there turning in sharp zigzags; occasionally broadening into canoe-shaped pools, or emptying by little sparkling cataracts into deeper trenches, sometimes passing under tiny bridges or running into devious tunnels—a veritable toyland carved in ice.

But unfortunately these fascinating little features are ephemeral, and seldom outlast the day; for, evenings, as the lowering sun withdraws its heat, the melting gradually comes to a halt, and the little streams cease to flow. The soft babbling and gurgling and the often exquisitely melodious tinkle of dripping water in hidden glacial wells are hushed, and the silent frost chokes up the passages and channels, so that next day's waters have to create new avenues.

In the marginal zone where the crevasses open, the surface drainage comes abruptly to an end. Here gaping chutes of deepest azure entrap the torrents, and the waters rush with musical thunder

to the interior of the glacier and finally down to its bed.

More beautiful and more impressive by far than any of the surface sculpture of the glacier, however, are the caverns or grottos that are melted out in its interior. Almost every year some sub-glacial passage of this kind is produced in the frontal margin by one of the streamlets that go to form the Paradise River. In the course of the summer it may develop into a glorious archway 10 to 15 feet in height, that can be explored for a distance of 100 to 200 feet under the ice. Nothing more entrancing could be imagined: the play of light from the outside on the fantastically scalloped and fluted walls, and the chromatic range of tints, shading from delicate green inward to deepest ultramarine, produce an effect as of a fairy palace of rarest marble, sparkling with precious stones.

Wonder is often expressed at the height of the archway, which seems out of proportion to the streamlet that courses, but a few inches deep, among the rocks under foot. The fact is that the streamlet has done little more than initiate the course of the tunnel. Once the opening is made, circulating currents of balmy summer air gradually enlarge it, and give it its distinctive form. The mysterious sculptors continue their work until winter sets in and freezing temperatures call a halt.

Cowlitz Glacier

Immediately adjoining the Paradise Glacier on the northeast, and separated from it only by an indefinite barrier, is the Cowlitz Glacier, one of the longest and most stately ice rivers on Mount Rainier. It extends in a southeasterly direction and terminates far down among forest-covered hills.

Its upper course consists of two parallel ice streams, both intrenched in profound troughs, which they have enlarged until now there remains between them only a ragged partition or crest of rock a thousand feet in height. At the upper end of this crest stands Gibraltar Rock.

Both branches cascade steeply down to their point of confluence; indeed the ice falls and cascades of the north branch, which is named Ingraham Glacier (after Major E. S. Ingraham, one of Rainier's foremost pioneers), are among the grandest of the many to be seen on the peak.

Below the point of confluence the main glacier has a gentle and relatively uneventful course. A medial moraine extends like a black tape along its back, showing clearly by its central position that the two tributary glaciers are very nearly equal in volume. And this is a fact of no small interest for, when traced to their sources, the two tributaries are found to originate in wholly different ways. The north branch comes from the névés on the main summit of the mountain; but the south branch heads in a pocket immediately under Gibraltar. No snow comes to it from the summit region, hence it follows that it receives through direct precipitation and wind drifting about as much sustenance as its sister branch draws from the summit névés.

Like the glacier troughs below, the pocket under Gibraltar appears to have been widened by glaciation until now it is separated from the ice fields of the Nisqually by only a narrow rock crest, the Cowlitz Cleaver, as it is appropriately called. Up this narrow crest lies the trail to Gibraltar Rock and the summit.

The Cowlitz Glacier, including its north branch, the Ingraham Glacier, measures slightly over 6 miles in

length. Throughout that distance the ice stream lies sunk in a steep-walled canyon of its own carving. Imposing cliffs of columnar basalt, ribbed like gigantic corduroy, overlook its waste-covered lower course. Slender waterfalls, that seem from afar mere threads of silver, glide down their precipitous fronts, guided by the basalt flutings.

From the end of the glacier issues the Muddy Fork of the Cowlitz River, which, joining the Ohanapecosh, forms the Cowlitz River proper, one of the largest streams of the Cascade Range. For nearly a hundred miles the Cowlitz follows a southwesterly course, emptying finally in the Columbia River a short distance below Portland, Oregon.

The name Muddy Fork is appropriate, for the stream leaves the glacier heavily charged with rock waste, and though it gradually clears itself as it flows on, it is still turbid when it reaches the Ohanapecosh. That stream is relatively clear, for it heads in a glacier of small extent and little eroding power, and therefore begins its career with but a moderate load; furthermore, it receives on its circuitous course a number of tributaries from the Cascade Range, all of them containing clear water.

The name Muddy, however, might with equal appropriateness be given to every one of the streams that flow from the ice fields of Mount Rainier. So easily disintegrated are the volcanic materials of that peak, that the glaciers erode with great rapidity, even in their present shrunken state. They consequently deliver to the streams vast quantities of rock waste, much of it in the form of cobbles and boulders, but much of it also in the form of "rock flour."

A considerable proportion of a glacier's erosional work is performed by abrasion or grinding, the bed

being scoured and grooved by the blocks and smaller fragments of rock which are frozen in the ice. As a result glacier streams carry much finely comminuted rock, and this, because of its fineness, remains long in suspension and imparts to the water a distinctive color. In regions of light-colored rocks the glacier streams have a characteristic milky hue, which, as it fades, passes into a delicate turquoise tint. But the lavas of Mount Rainier are for the most part ruddy or chocolate-hued, and as a consequence the rivers that come from that peak are dyed a somber brown.

A word may not be out of place about the sharp fluctuations in volume of the ice-fed rivers of the Mount Rainier National Park, especially in view of the difficulties which they present to fording. Fully a score of turbulent rivers radiate from the peak, and as a consequence one cannot journey far through the park without being obliged to cross one of them. On all the permanent trails substantial bridges obviate the difficulty, but in the less developed parts of the park, fording is still the only method available. Now these rivers, being nourished by melting glaciers, differ greatly in habit from streams in countries where glaciers are absent. Generally speaking, they are higher in summer than in winter; also, in summer, when the sun reaches its greatest power, they are subject to daily floods, reaching a maximum in the afternoon, but during the night and early morning hours they ebb to relatively insignificant volume. On a warm day they wax hourly in volume and in violence, until toward noon they are raging torrents of liquid mud in which heavy cobbles and even boulders may be heard pounding as they roll before the current. It would be nothing short of folly to attempt to ford under these conditions, whether on horseback or on foot. But in the

evening, and still later, in the early morning, they may be crossed in safety; the torrents then having shrunk to harmless brooks.

Glaciers on Little Tahoma

High above the Ingraham Glacier towers that sharp-profiled peak named Little Tahoma (11,117 feet), the highest outstanding eminence on the eastern flank of Mount Rainier. It is the culminating point of a gigantic "wedge" that parts the Ingraham from the Emmons Glacier to the north. So vast is this wedge that it carries on its back three large interglaciers separated from each other by attenuated, pinnacled cleavers. These are Whitman, Ohanapecosh, and Fryingpan glaciers.

The Whitman Glacier slopes in a southerly direction and, doubtless because of its exposure to the heat of the midday sun, terminates at a relatively high level. Its main lobe ends at an elevation of 7,100 feet, whereas the Ohanapecosh and Fryingpan glaciers both reach down to elevations of less than 6,000 feet. On the broad rock benches to the southeast lie several detached ice fields which at a time probably not remote were connected with the Whitman Glacier. That ice body then was at least twice as large as it is today.

From the Whitman Glacier and its dwindling remnants the waters cascade boisterously down a thousand feet or more into the canyon of the Cowlitz Glacier. There they collect into a single brawling stream that courses mile after mile immediately along the margin of the ice. Evidently the glacier presses upon its bed so heavily as to exclude the stream.

The Ohanapecosh Glacier faces directly eastward. It is much broader than long and cascades abruptly

from successive rock shelves into that broad amphitheater in whose bosom lies Ohanapecosh Park. Formerly, no doubt, it filled this amphitheater completely, but now it sends down toward Indian Bar only a shrunken, partly stagnant lobe. The stream which issues from this lobe is the head of the Ohanapecosh River.

Larger than either of the preceding is the Fryingpan Glacier, which covers the northern half of the Little Tahoma wedge. It has an areal extent of 3 square miles and is easily the finest and most typical interglacier on the flanks of Mount Rainier. Contrary to the implication of its name, it is essentially triangular in shape. Its apex clings to the precipitous cliffs of Little Tahoma, at an altitude of 10,800 feet; and thence its sides diverge in nearly straight lines to a breadth of more than two miles at the lower margin.

The lobe which forms the northern corner reaches to within a few hundred feet of the Emmons Glacier. Evidently but a short time ago it was tributary to that ice stream. The lobe at the eastern corner—which because of its length probably suggested the handle of a frying pan—and several intermediate minor lobes not really appropriate to the smooth contours of that culinary implement, send forth the streamlets that combine to form Fryingpan Creek, a branch of White River. These streamlets rush through the charming, flower-dotted meadows of Summer Land.

From Little Tahoma eastward there extends a backbone ridge 5 miles in length, ending at the Cowlitz Chimneys, a group of tall rock towers that dominate the country east of Mount Rainier. On its shaded north side this backbone bears a row of small detached glacierets—the Sarvent Glaciers. They are of

peculiar interest both because they extend farther out from the main peak than any other members of its glacier system, and because they originate at levels considerably below 7,000 feet. One of them, even, lies below the Panhandle Gap, which has an altitude of only 6,600 feet. They show that even today the winter snows are sufficiently abundant to maintain independent ice bodies in sheltered positions on ridges of only moderate altitude.

Emmons Glacier

This glacier, which is named for Samuel F. Emmons, the noted geologist, explorer, and mountaineer, who was the second to conquer the peak in 1870, is the most extensive and in many ways the most impressive of all its ice streams. It cloaks the entire east flank with magnificent but terribly forbidding ice cascades. It measures 5½ miles in length, 1¾ miles in width, and has an areal extent of not less than 8 square miles.

Under its erosive action the rim of the old crater has completely broken down over a distance of 1½ miles. But two small crags still protrude through the ice mass, like dark rock islands in the foaming rapids of a broad river. From each of them trails a long medial moraine.

Conspicuous lateral moraines border the ice stream on both sides. Several parallel ridges of this sort are disposed on the flanking slopes in successive tiers one above another. Most impressively do they attest the successive stages in the reduction of the glacier. The youngest moraine, sharp-crested and fresh looking, as if it had been deposited only yesterday, lies but 50 feet above the glacier's surface and a scant 100 feet distant from its edge; the older ridges, more subdued in out-

line, and already tinged with verdure, lie several hundred feet higher on the slope.

The Emmons Glacier, like the Nisqually and the Cowlitz, becomes densely littered with rock waste at its lower end, but maintains for a considerable distance broad lanes of clear ice. The stream which it sends forth, White River, is the largest of all the ice-fed streams that radiate from the peak. It flows first northeastward, then turns in a northwesterly direction, and finally empties into Puget Sound.

Winthrop Glacier

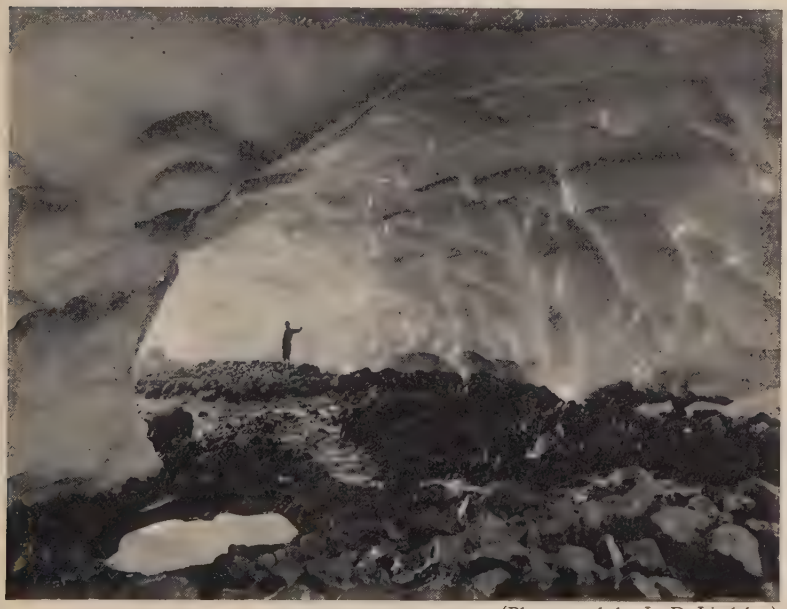
On the northeast side of the mountain, descending from the same high névés as the Emmons Glacier, is the Winthrop Glacier, which was named in honor of Theodore Winthrop, who visited the mountain as early as 1853. Not until halfway down, at an elevation of about 10,000 feet, does it detach itself as a separate ice stream. The division takes place at the apex of that great triangular interspace so aptly named "The Wedge." Upon its sharp edge, Steamboat Prow, the descending névés part, it has been said, like swift flowing waters upon the bow of a ship at anchor. The likeness is an excellent one; even the long foam crest along the ship's side is simulated by a wave of ice.

Undoubtedly "The Wedge" headed formerly much higher up on the mountain's flank. Perhaps it extended upward in the form of a long attenuated "cleaver." It is easy to see how the ice masses impinging upon it have reduced it to successively lower levels. They are still unrelentingly at work. On the back of the Wedge, it may be added, is situated that small ice body which Major Ingraham named the Inter

(Copyrighted by Asahel Curtis)

The North-East Side Showing the Emmons Glacier Extending Down from the Summit of the Cone for a Distance of Six Miles

On the right may be seen the upper reaches of the Winthrop Glacier



(Photograph by L. D. Lindsley)

Sunlight Filtering Through 100 Feet of Solid Ice

Every color of the rainbow is represented although blues and greens predominate

Glacier, and which has since been recognized as the prototype of all similar ice bodies that lie on the wedges between the main glacier canyons.

Of especial interest on the Winthrop Glacier are the ice cascades and domes. Evidently the bed of the glacier is very uneven and gives rise to successive falls and pools, such as occur in a turbulent mountain stream. The cascades are readily understood, but the domes require a word of explanation. They are underlain by rounded bosses of resistant rock. Over these the ice must rise, much as the water in a swift torrent rises over submerged boulders. Immediately above each obstruction the ice is as a rule compact and free from crevasses, but as it reaches the top and begins to pour over, it breaks and is divided by intersecting cracks into prismatic blocks and fantastic obelisks. Below each dome there is usually a deep hollow partly inclosed by trailing ice ridges, analogous to the whirling eddy that occurs normally below a boulder in a rock. Thus does a glacier simulate a stream of water even in its minor details.

The domes of the Winthrop Glacier measure 50 to 60 feet in height. A sample of the kind of obstruction by which they are produced appears, as if specially provided to satisfy human curiosity, near the terminus of the glacier. There one may see, close to the west wall of the troughlike bed, a projecting rock mass, rounded and smoothly polished, from which the glacier receded not long ago.

Other features of interest for which the Winthrop Glacier is noted are the "glacier tables." These consist of slabs of rock mounted each on a pedestal of snow, and may be likened to huge toadstools. The slabs are always of large size, and the pedestals vary in height from a few inches to several feet. The slabs

are derived from the cliffs that overlook the glacier; indeed, the presence of such débris shedding cliffs is a "sine qua non" for the production of glacier tables.

The manner in which the pedestals are generated almost explains itself: the snow immediately under each slab is effectually protected from the sun and does not melt, whereas the surrounding snow, being unprotected, wastes away, often at the rate of several inches per day. Thus in a short time the slab is left poised on a column of its own conserving. There is, however, a limit to the height which such a column can attain, for as soon as it exceeds a certain height the protecting shadow of the capping stone no longer reaches to its base, and the slanting rays of the sun begin to undermine it.

Not uncommonly, the south side of the pedestal is softened somewhat every day by the heat reflected from the surrounding ice surface, and as a consequence the table begins to tilt. On very hot days, in fact, the inclined table turns with the progress of the sun, much after the manner of a sun-loving flower, the slant being to the southeast in the forenoon and to the southwest in the afternoon. As the snow pillar increases in height, its exposed surface also increases and the tilting is accentuated until at last the rock slides down.

In its new position the slab at once begins to generate a new pedestal, from which in due time it again slides down and so the process may be repeated several times in the course of a summer, the rock shifting its location by successive slips over an appreciable distance, always in a southerly direction.

As has been stated, the capping rocks of glacier tables are generally of large size. This is not a fortuitous circumstance: rocks under a certain size, especially thin slabs, cannot produce any pedestals; far

from conserving the ice under them, they accelerate its melting by transmitting the heat they have absorbed, and etch out, as it were, depressions in the glacier's surface. Dark colored rocks do so more readily than light colored ones, for they absorb the solar heat more quickly and also transmit it more freely. Small fragments and thin slabs, accordingly, on warm summer days sink into the glacier, each in a hollow to fit its form. Even scattered rock grains and particles of dust produce tiny wells, a fraction of an inch to more than an inch in depth, and inclined at an angle, in the direction of the noonday sun. And thus in some places the apparently anomalous spectacle presents itself of large rocks several tons in weight that are supported on ice pillars, alongside of small, light fragments that lie sunk below the surface of the glacier.

Carbon Glacier

In many ways the most interesting of all the ice streams on Mount Rainier is the Carbon Glacier, the great ice river on the north side, which flows between those two charming natural gardens, Moraine Park and Spray Park. Third in point of length, it heads, curiously, not on the summit, but in a vast amphitheater, deeply inset into the mountain's flank. This amphitheater is what is technically termed a glacial cirque elaborated by the glacier itself from a gash in this side of the volcano. It has the distinction of being the largest of all the ice-sculptured cirques on Mount Rainier, and one of the grandest in the world. It measures more than a mile and a half in diameter, and its head wall—named Willis Wall, in honor of Prof. Bailey Willis, who explored the north side of the mountain and laid the first trail to the Carbon Gla-

cier in 1881—towers a sheer 3,600 feet in height. So well proportioned is the great hollow, however, and so simple are its outlines that the eye finds difficulty in correctly estimating the dimensions. Not until an avalanche breaks from the 300-foot névé cliff above and goes booming down over the precipice in shimmering clouds, does one begin to realize the depth of the recess. The falling ice mass is several seconds on the way, and though weighing hundreds of tons, seemingly floats down as leisurely as a snowflake.

These avalanches once were believed to be the sole authors of the cirque. They were thought to have worn back the head wall little by little, just as a waterfall causes the cliff under it to recede. But the processes by which glacial cirques are evolved are better understood today. It is now realized that cirques are produced primarily by the eroding action of the ice masses that are embedded in them. Slowly creeping forward, these ice masses, shod with débris derived from the encircling cliffs, scoop out and enlarge the hollows. Their work is supplemented by the rock-splitting action of water freezing in the interstices of the rock walls. This sapping process is particularly effective in the cleft that opens at the glacier's head, between ice and cliff. Periodically this abyss is filled with fresh snows, which freeze to the rock; then, as the glacier moves, it tears or plucks out the frost-split fragments. Thus the wall is continually being undercut; its overhanging portions fall down, or are borne down by the avalanches, and so it recedes through the action of all these processes combined.

A glacier, then, literally gnaws its way headward into the mountain. But it also attacks the cliffs that flank it, and thereby widens the depression in which it lies, and thus tends to give it an amphitheater-like

(Copyrighted by Asahel Curtis)

The Cirque of the Carbon Glacier

Willis Wall which stands at the head of the cirque is an almost sheer cliff 3,600 feet high down which avalanches crash at frequent intervals

form. In its greatest perfection a glacial cirque is horse-shoe-shaped. The Carbon Glacier's cirque, it will be noticed, consists really of two twin cirques, separated by a projecting buttress—the Liberty Ridge. This buttress is the remnant, doubtless, of a long spur that formerly divided the cavity, and is fast being eliminated by the glacial processes, so that in time the head wall will describe a smooth, uninterrupted curve.

By its headward gnawing the Carbon Glacier, as may be readily observed on the map, has cut in appreciably upon the summit platform of the mountain, the massive northwest portion of the crater rim on which stands Liberty Cap. In so doing it has made great inroads upon the névé fields whence come the avalanches, and has reduced this source of supply. On the other hand, by deploying laterally, the glacier has captured part of the névés that formerly were tributary to the ice fields to the west, and has made good some of the losses due to its headward cutting. But, after all, these are events of relatively slight importance in the glacier's career; for like the lower ice fields of the Nisqually, and most glaciers on the lower slopes of the mountain, the Carbon Glacier is not wholly dependent upon the summit névés for nourishment. The avalanches, imposing though they are, contribute but little to its bulk. Most of its substance is derived directly from the low hanging clouds, or is blown into the cirque by eddying winds.

The middle course of the Carbon Glacier does not differ materially from the middle courses of the other main glaciers already described. But toward its terminus the ice stream assumes a very distinctive aspect, narrowing down to what may be properly termed an "ice tongue" only a few hundred yards wide but more than a mile long. This ice tongue lies deeply ensconced

in the rugged canyon of the Carbon River, which canyon is overlooked from the east by the Elysian Fields, and from the west by Seattle Park.

The glacier ends at an elevation of only 3,600 feet, almost 600 feet lower than any other ice stream on Mount Rainier. A beautiful cave is often formed at the point of exit of the Carbon River.

Russell and Flett Glaciers

The Russell Glacier, which was named in honor of Prof. Israel C. Russell, who was the first scientist to study and describe the glaciers of Mount Rainier, is one of the largest interglaciers, and covers the broadly spreading wedge that slopes from the northwestern buttress of the peak down to Spray Park. Viewed from the east, it looks like a resplendent mantle, far flung and draped in successive folds that trail down to the more somber, débris-laden Carbon Glacier. Two sharp pinnacles, Observation Rock (8,364 feet) and Echo Rock (7,862 feet), stand out above its dazzling surface.

The Flett Glacier, named in honor of Prof. J. B. Flett, the botanist, is situated immediately to the west of the Russell Glacier, separated from it only by a cleaver that descends northward from Observation Rock. It measures less than a mile in length and is among the smallest ice bodies in the Rainier Park that have been dignified with a name. Withal, it is of peculiar interest in that it demonstrates more clearly than any of the glaciers on the main peak the ability of the snow clouds to maintain in existence independent ice bodies at fairly low levels and on broadly exposed surfaces, where the losses due to melting in summer

must be very great. Its annual variations in extent, if systematically measured, would doubtless afford an accurate index of the fluctuations of the present climate—a much more accurate index, surely, than the variations of the longer and more complex glaciers would afford.

North Mowich Glacier

The North Mowich Glacier is the northernmost of the series of ice bodies that cling to the western flank of Mount Rainier. Like the Carbon Glacier, it heads in a low-level cirque fed by direct snow precipitation, wind drifting, and avalanches. The cirque is small and not nearly as capacious as either of the twin recesses in the Carbon Glacier's amphitheater. As a consequence the ice stream has only moderate volume. Nevertheless it attains a length of 3¾ miles, in part owing to the heavy snows that fall upon its middle course and in part owing to the reinforcements it receives from the ice fields that border it on the south. These ice fields, almost extensive enough to constitute a distinct glacier, are separated from the North Mowich Glacier by a mere row of pinnacles, the remnants, evidently, of a rock partition or "cleaver," now demolished by the ice. The lowest and most prominent of the rock spires bears the appropriate name of Needle Rock (7,575 feet).

The débris-covered lower end of the glacier is divided into two short lobes by a rounded boss in the middle of the channel. This boss, when it was being overridden by the glacier, doubtless gave rise to an ice dome of the kind so numerous farther up on the North Mowich Glacier and also characteristic of the Winthrop Glacier.

South Mowich Glacier

The South Mowich Glacier is separated from the North Mowich Glacier by the interglacier named in honor of Senator George F. Edmunds of Vermont. It also is a cirque-born ice stream, the shortest on the western side of Mount Rainier, having a length of only 3 miles. One-half of its substance is derived from a low-level cirque; the other half is contributed by its southern neighbor, the Puyallup Glacier, which originates at a much higher level.

Toward its lower end the South Mowich Glacier splits into two unequal lobes, of which the southern is by far the longer. Small sharp wedges situated in front of the glacier show clearly that formerly, when it reached farther down, it was divided into three narrow, parallel tongues.

The northern lobe is of interest because the waters that cascade down from the Edmunds Glacier run underneath it in a long tunnel. In the near future the lobe probably will recede sufficiently to permit the stream to pass by its front unhindered.

Puyallup Glacier

The Puyallup Glacier differs from its neighbors to the north in that it originates in a remarkably high cirque. The Carbon, North Mowich, and South Mowich glaciers all head at levels of about 10,000 feet, but the Puyallup Glacier has its source in the Sunset Amphitheater at an altitude of over 12,000 feet. Encircled by a great vertical wall that cuts into the Liberty Cap platform from the south, this amphitheater has been developed in all probability from a large hollow of volcanic origin. From it the Puyallup

Glacier descends by a rather narrow chute. Below this chute the glacier again expands to a width of three-fourths of a mile and sends a portion of its volume to the South Mowich Glacier. In spite of this loss it continues to expand, reaching a maximum width of a mile and a total length of 4 miles. No doubt this is accounted for by the heavy snowfalls that replenish it throughout its middle course.

Near its lower end the glacier is split by a wedge of rock into two tapering lobes. The right-hand lobe, which is much the larger of the two, lies in a remarkably tortuous canyon, flanked on the north by a sheer cliff of volcanic rock.

Tahoma Glacier

Immediately south of the Sunset Amphitheater the crater rim of the volcano is breached for a distance of half a mile. Through this gap a voluminous ice cascade tumbles from the summit regions, and this ice cascade, reinforced by a flow from the Sunset Amphitheater, forms the great Tahoma Glacier, the most majestic ice stream on the southwestern side. Separated from its northern neighbor by a long, straight cleaver it flows in a direct course for a distance of 5 miles. Its surface, more than a mile broad in places, is diversified by countless ice falls and cataracts.

Only a row of isolated pinnacles indicates its eastern border, and across the gaps in this row its névés coalesce with those of the South Tahoma Glacier. Farther down the two ice streams abruptly part company and flow around opposite sides of a deeply sculptured, cliff-girt rock mass named Glacier Island. About a mile above its terminus, the Tahoma Glacier splits upon a low, verdant wedge and sends a lobe southward,

skirting the walls of this island rock. At the base this lobe again joins the South Tahoma Glacier, and the two ice streams merge, thus completely isolating the rock mass. Together they now form a single waste-covered glacier, of strangely chaotic appearance, which the layman might readily assume to be a vast dump of rock débris. Numerous rivulets course over its dark hummocky surface only to disappear in mysterious holes or clefts. Deep circular kettles filled with muddy water often develop on it during the summer months, and after a brief existence are emptied through sub-glacial passages, or by some newly formed crevasse. So abundant is the fine rock waste released by the melting that at times it is whipped up by the wind into veritable dust storms.

Remarkably high and regular moraines border the ice mass on both sides, giving clear evidence of its recent shrinking.

South Tahoma Glacier

The companion of the Tahoma Glacier, known as the South Tahoma Glacier, heads in a profound cirque sculptured in the flanks of the great buttresses that culminate in Point Success (14,150 feet). It is a fine example of a cirque-born glacier, nourished almost exclusively by direct snowfalls from the clouds and by eddying winds. In spite of its exposure to the afternoon sun, it has a length of nearly 4 miles,—a fact which impressively attests the ampleness of its ice supply.

In glacial times the glacier had much greater volume and overrode the south half of Glacier Island, as is clearly shown by the glacial grooves and the scattered ice-worn boulders which it has left on that emi-

nence. As the glacier shrank it continued for some time to send a lobe through the gulch across the middle of the island. Even now a portion of this lobe remains, but it no longer connects with the Tahoma Glacier.

An excellent nearby view of the lower cascades of the South Tahoma Glacier may be had from the ice-scarred platform west of Pyramid Rock. From that platform, as well as from the other heights of Indian Henry's Hunting Ground, there unfolds itself to the view a panorama of glacier ice and imposing rock forms such as is to be seen in few places in this country.

Pyramid and Kautz Glaciers

East of the South Tahoma Glacier, heading against a great cleaver that descends from Point Success, lies a triangular ice field, or interglacier, named Pyramid Glacier. It covers a fairly smooth, gently sloping platform underlain by a heavy lava bed that breaks off at its lower edge in precipitous, columnar cliffs. Into this platform a deep but narrow box canyon has been cut by the Kautz Glacier, which descends from the summit névés east of Point Success. This ice stream was named, appropriately, in honor of Gen. A. V. Kautz, who in 1857 boldly sought to gain the summit of Rainier by way of Point Success. On the map the Kautz Glacier has an almost wormlike appearance, because of its narrowness and its sinuous course. In spite of its meager width, which averages but 1,000 feet, the ice stream has a length of almost 4 miles and descends to an altitude of 4,800 feet. Its ability to penetrate to such a low altitude, although facing slightly west of south, is explained by its deeply ensconced position between shading cliffs.

The Kautz Glacier receives one important tribu-

lation was an unfortunate misnomer as the basin is not of volcanic origin. It is surrounded by volcanic rocks, it is true, but these are merely of the kind which overspread most of the Rainier region. The hollow unquestionably is a product of glacial erosion. It was once the cradle of a small glacier, and through the headward gnawing of that ice mass was enlarged from an ordinary stream-worn valley into a broad amphitheater, a typical glacial cirque. The lake basin in the center is a strictly normal feature. Glacial cirques commonly possess such basins, scooped out in the weaker portions of their floors; but it is seldom that such features acquire the remarkable symmetry of form that is exhibited by Mowich Lake. All the neighboring valley heads of semicircular form are likewise abandoned cirques, and their lakelets also are due to glacial erosion.

As for the attenuated form of the dividing crests, it is the result, clearly, of the headward gnawing of glaciers in opposing cirques. In some places, the enlargement of the cirques has progressed so far as to breach the ridges. West of Mowich Lake, notably, is an instance of a crest that has been breached for a considerable distance.

It is a significant fact that the empty cirques about the Mother Mountains lie at elevations ranging between 4,500 and 6,000 feet,—that is, on an average 5,000 feet lower than those cirques on Mount Rainier which now produce glaciers. The same is true of the cirques on the Tatoosh Range and on the other neighboring crests of the Cascade Range. Evidently during the Ice Age glaciers were generated at much lower levels than today. What is more, a comparison of the dimensions of these empty cirques and of the glacier canyons that lead from them, with those of the cirques and glacier canyons on Mount Rainier shows clearly

(Photograph by L. D. Lindsley)

Beautiful Mowich Lake in the Cirque of a Former Glacier

Mowich is a Chinook word meaning deer. Fay Peak stands beyond

lation was an unfortunate misnomer as the basin is not of volcanic origin. It is surrounded by volcanic rocks, it is true, but these are merely of the kind which overspread most of the Rainier region. The hollow unquestionably is a product of glacial erosion. It was once the cradle of a small glacier, and through the headward gnawing of that ice mass was enlarged from an ordinary stream-worn valley into a broad amphitheater, a typical glacial cirque. The lake basin in the center is a strictly normal feature. Glacial cirques commonly possess such basins, scooped out in the weaker portions of their floors; but it is seldom that such features acquire the remarkable symmetry of form that is exhibited by Mowich Lake. All the neighboring valley heads of semicircular form are likewise abandoned cirques, and their lakelets also are due to glacial erosion.

As for the attenuated form of the dividing crests, it is the result, clearly, of the headward gnawing of glaciers in opposing cirques. In some places, the enlargement of the cirques has progressed so far as to breach the ridges. West of Mowich Lake, notably, is an instance of a crest that has been breached for a considerable distance.

It is a significant fact that the empty cirques about the Mother Mountains lie at elevations ranging between 4,500 and 6,000 feet,—that is, on an average 5,000 feet lower than those cirques on Mount Rainier which now produce glaciers. The same is true of the cirques on the Tatoosh Range and on the other neighboring crests of the Cascade Range. Evidently during the Ice Age glaciers were generated at much lower levels than today. What is more, a comparison of the dimensions of these empty cirques and of the glacier canyons that lead from them, with those of the cirques and glacier canyons on Mount Rainier shows clearly

(Photograph by L. D. Lindsley)

Beautiful Mowich Lake in the Cirque of a Former Glacier

Mowich is a Chinook word meaning deer. Fay Peak stands beyond

that the low-level glaciers of the Ice Age were, many of them, of very large size and exceeded in volume the glaciers which came down the sides of the peak, whether from the 10,000-foot cirques or from the summit.

Anomalous though at first this may seem, the explanation readily suggests itself: In glacial times, owing to the cooler climate, the zone of maximum snowfall was depressed considerably below its present level, probably as much as 4,000 or 5,000 feet. The main level of glacier generation thereby was shifted down to the very base of the great volcano, and its upper parts were left projecting into atmospheric strata that were truly arid. The 10,000-foot cirques on its sides probably were no better alimented by the clouds than they are today, and as for the summit, it doubtless received less snow and perhaps was partly bare.

The enormous glaciers which during the Ice Age filled all the valleys of the Cascade Range, should, then, be conceived as having originated at relatively low levels—in general below the level of those crests of which the Mother Mountains and the Tatoosh Range are characteristic examples. To those ancient valley glaciers the ice streams on the cone of Mount Rainier were mere tributaries. There is abundant evidence that they increased greatly in volume towards the base of the cone; but there is equally good evidence that they were no larger on the higher parts of the cone than they are today.

Fauna and Flora of Glaciers

When snow assumes the mushy, "wet-sugar" state, it is melting internally as well as at its outer surface, owing both to the water that soaks into it and to the

warming of the air inclosed within its innumerable tiny pores (which tiny air spaces, by the way, give the snow its brilliant whiteness). Snow in this condition has, paradoxical though it may sound, a temperature a few tenths of a degree above the melting point—a fact recently established by delicate temperature measurements made on European glaciers. It is this singular fact, no doubt, that explains how so many minute organisms are able to flourish and propagate in summer on the lower portions of the glaciers.

Several species of insects are among the regular inhabitants of glaciers. Most of them belong to a very low order—the Springtails, or *Thysanura*—and are so minute that in spite of their dark color they escape the attention of most passers-by. By looking closely, however, one may readily observe them hopping about like miniature fleas or wriggling deftly into the cavities of the snow. They seem to be little incommoded if in their acrobatic jumps they occasionally alight in a puddle or in a rill, for they are thickly clad with furry scales that prevent them from getting wet—just as a duck is kept dry by its greasy feathers.

Especially plentiful on the lower parts of the Rainier glaciers, and more readily recognized, are slender dark-brown worms of the genus *Mesenchytræus*, about 1 inch in length. On favorable days in July and August millions and millions of them may be seen writhing on the surface of the ice, evidently breeding there and feeding on organic matter blown upon the glacier in the form of dust. So essential to their existence evidently is the chill of the ice that they enter several inches, and sometimes many feet below the surface on days when the sun is very hot, reappearing late in the afternoon.

Mention deserves to be made also of that micro-

scopic plant *Protococcus nivalis*, which produces the mysterious pink or rose-colored patches so often met with on glaciers—the "red snow" of a former superstition. Each patch represents a colony or culture comprising billions of individuals. Perhaps they represent but a small fraction of the total microflora that thrives on the snow, the other species remaining invisible for lack of a conspicuous color.

CHAPTER III

Human History [1]

In the spring of the year 1792, Captain George Vancouver, in command of the ship "Discovery" of the Royal British Navy, sailed into Puget Sound and was the first white man to see the mountain, at least the first white man to leave any record of having seen the peak.

Spanish fur traders and explorers had frequented the northwest coast for several years previous to Vancouver's discovery, but if they ever sighted the great snow dome that dominates the Puget Sound country they left us no record of it.

The following extract from his "Voyage of Discovery to the North Pacific Ocean," published in London in 1801, following Captain Vancouver's death, is the basis for calling the mountain "Mount Rainier."

(May 7th, 1792, while at Admiralty Inlet) ". . . Mount Baker bore N. 26 E.; a steep bluff point opposite to us, appearing to form the west point of another arm of this inlet, S. 87 E. about four miles distant; the nearest eastern shore S. 50 E. about two miles; *and a very round high mountain, covered with snow, apparently at the southern extremity*

[1] Much of the material on the history of the Park region was collected by Professor Edmond S. Meany of the University of Washington. It is here used with Professor Meany's consent.

of the distant snowy range of mountains before noticed, bore S. 45 E. . . ."

(May 8th, 1792, while at Marrow-Stone point, Admiralty Inlet) ". . . The weather was serene and pleasant, and the country continued to exhibit, between us and the eastern snowy range, the same luxuriant appearance. At its northern extremity, Mount Baker bore by compass N. 22 E.; *the round snowy mountain, now forming its southern extremity, and which after my friend Rear Admiral Rainier I distinguished by the name Mount Rainier, bore S. 42 E.*"

Captain George Vancouver, though he lived but forty years, from 1758 to 1798, ranks among England's great navigators and explorers. He entered the British navy on the "Resolution" under Captain James Cook in 1771 and was with that even more famous explorer during his second and third voyages, from 1772 to 1780. He was placed in command of the "Discovery" and "Chatham" in 1791 and sent to the northwest coast of America. On this voyage he discovered and named Puget Sound and many other geographic features on the western coast of America.

Rear Admiral Peter Rainier, although he ranked higher than Captain Vancouver, was not his superior officer, merely, as he says, a friend.

Rainier never visited America and therefore never saw the mountain. Very little is left in the way of a record of his life.

It was not until 1833 that any close approach to the great mountain discovered by Vancouver was made. In that year Dr. William Fraser Tolmie, a medical officer and an amateur botanist in the employ of the Hudson Bay Company, with several Indian companions made his way on what he called a "botanizing excursion" to the northwest edge of what is now the Mount Rainier National Park. The small peak just south of

the road at the Carbon River entrance to the Park is the farthest point reached by Doctor Tolmie. It and the creek flowing from it bear his name. At the time Doctor Tolmie was stationed at the Hudson Bay post, called Nisqually House, on Puget Sound. Later he was raised to the rank of Chief Factor and was placed on the board of management of the great Company.

Twenty-four years after Doctor Tolmie first approached the mountain, Lieutenant A. V. Kautz of the United States Army, who at the time was stationed at Fort Steilacoom on Puget Sound, made the first attempt to scale the peak.

Taking with him as companions the Post doctor, two soldiers and an old Indian of the Nisqually tribe, Wah-pow-e-ty by name, as guide, they started out from Fort Steilacoom early in July of the year 1857.

> Information [as Lieutenant Kautz says in an account of the trip published in the "Overland Monthly" of May, 1875] relating to the mountain was exceedingly meager; no white man had ever been near it and Indians were very superstitious and afraid of it. The southern slope seemed the least abrupt and in that direction I proposed to reach the mountain.

The party, however, greatly misjudged the difficulties to be overcome and the distance to be traversed. When finally they found themselves at the base of the peak ready for the main ascent they had spent five strenuous days; while they had made plans, and accordingly carried only enough provisions for a total of six days for the round trip.

However, fatigued as they were, they set out boldly from their camp at the foot of the Nisqually Glacier, near the point where the automobile bridge now crosses the river, for the final attempt.

According to his own account:

On the morning of the sixth day we set out again up the glacier. A drizzling rain prevailed through the night, and continued this morning. We had a little trouble in getting upon the glacier as it terminated everywhere in steep faces that were very difficult to climb. Once up, we did not meet with any obstructions or interruptions for several hours, although the slippery surface of the glacier, which formed inclined planes of about twenty degrees, made it very fatiguing with our packs. About noon the weather thickened; snow, sleet and rain prevailed, and strong winds, blowing hither and thither, almost blinded us. The surface of the glacier, becoming steeper, began to be intersected by immense crevasses crossing our path, often compelling us to travel several hundred yards to gain a few feet. We finally resolved to find a camp. But getting off the glacier was no easy task. We found that the face of the lateral moraine was almost perpendicular, and composed of loose stones, sand, and gravel, furnishing a very uncertain foothold, besides being about fifty feet high. Wahpow-e-ty and I finally succeeded in getting up, and with the aid of the rope we assisted our companions to do the same. When we reached the top we were a little surprised to find that we had to go down-hill again to reach the mountain side. Here a few stunted pines furnished us fuel and shelter, and we rested for the remainder of the day. I explored a little in the evening by ascending the ridge from the glacier, and discovered that it would be much the best route to pursue in ascending to the summit.

When night set in, the solitude of our camp was very oppressive. We were near the limit of perpetual snow. The water for our tea we obtained from the melting of the ice near by. The atmosphere was very different from what it was below, and singularly clear when not obstructed by fog, rain, or snow. There were no familiar objects to enable one to estimate distance. When I caught a glimpse of the top of Rainier through the clouds, I felt certain that we

could reach it in three hours. The only living things to be seen were some animals, with regard to which we still labor under an error. These little creatures would make their appearance on the side of the mountain in sight of our camp and feed upon herbage that grew on the soil where the snow left it bare. The moment anyone stirred from camp, a sound between a whistle and scream would break unexpectedly and from some unknown quarter, and immediately all the animals that were in sight would vanish in the earth. Upon visiting the spot where they disappeared, we would find a burrow which was evidently the creatures' home. Everywhere round the entrance we found great numbers of tracks such as a lamb or kid would make. The animals that we saw were about the size of kids, and grazed and moved about so much like them, that, taken in connection with the tracks we saw, we jumped at once to the conclusion that they were mountain sheep, of which we all had heard a great deal, but none of our party had ever seen any. My report of these animals, which was published in the Washington "Republican" on our return, was severely ridiculed by some of the naturalists who were hunting for undescribed insects and animals in that country at the time. We are still at a loss to understand the habits of the creatures, and to reconcile the split hoofs which the tracks indicated with their burrow in the earth.

On the following morning—the seventh day from our camp on the Mishawl—the sky showed signs of clear weather, and we began the ascent of the main peak. Until about noon we were enveloped in clouds, and only occasionally did we get a glimpse of the peak. Soon after midday we reached suddenly a colder atmosphere, and found ourselves all at once above the clouds, which were spread out smooth and even as a sea, above which appeared the snowy peaks of St. Helens, Mount Adams, and Mount Hood, looking like pyramidal icebergs above an ocean. At first we could not see down through the clouds into the valleys. Above, the atmosphere was singularly clear, and the reflec-

tion of the sun upon the snow very powerful. The summit of Rainier seemed very close at hand.

About two o'clock in the afternoon the clouds rolled away like a scroll; in a very short time they had disappeared, and the Cascade Range lay before us in all its greatness. The view was too grand and extensive to be taken in at once, or in the short time we had to observe. The entire scene, with few exceptions, was covered with forests, with here and there barren rocky peaks that rose up out of the ridges; now and then a mountain lake, much more blue than the sky, and the Nisqually, winding like a thread of silver through the dark forests. From the foot of the glacier for several miles the bed of the river was very white, from the granite bowlders that covered the bed of the stream. The water, too, was of a decidedly chalkier color near its source.

We had no time, however, to study the beauties that lay before us. We had already discovered that there was no telling from appearances how far we had to go. The travel was very difficult; the surface of the snow was porous in some places, and at each step we sunk to our knees. Carroll and the Indian gave out early in the afternoon, and returned to camp. The doctor began to lag behind. Dogue stuck close to me. Between four and five o'clock we reached a very difficult point. It proved to be the crest of the mountain, where the comparatively smooth surface was much broken up, and inaccessible pinnacles of ice and deep crevasses interrupted our progress. It was not only difficult to go ahead, but exceedingly dangerous; a false step, or the loss of a foot-hold, would have been certain destruction. Dogue was evidently alarmed, for every time that I was unable to proceed, and turned back to find another passage, he would say, "I guess, Lieutenant, we petter go pack."

Finally we reached what may be called the top, for although there were points higher yet, the mountain spread out comparatively flat, and it was much easier to get along. The soldier threw himself down exhausted, and

said he could go no farther. The doctor was not in sight. I went on to explore by myself, but I returned in a quarter of an hour without my hat, fully satisfied that nothing more could be done. It was after six o'clock, the air was very cold, and the wind blew fiercely, so that in a second my hat which it carried away was far beyond recovery. The ice was forming in my canteen, and to stay on the mountain at such a temperature was to freeze to death, for we brought no blankets with us, and we could not delay, as it would be impossible to return along the crest of the mountain after dark. When I returned to where I had left the soldier, I found the doctor there also, and after a short consultation we decided to return.

Returning was far easier and more rapid than going. The snow was much harder and firmer, and we passed over in three hours, coming down, what required ten in going up. We were greatly fatigued by the day's toil, and the descent was not accomplished without an occasional rest of our weary limbs. In one place the snow was crusted over, and for a short distance the mountain was very steep, and required the skillful use of the stick to prevent our going much faster than we desired. The soldier lost his footing, and rolled helplessly to the foot of the declivity, thirty or forty yards distant, and his face bore the traces of the scratching for many a day after, as if he had been through a bramble-bush.

We found the Indian and Carroll in the camp. The latter had a long story to tell of his wanderings to find camp, and both stated that the fatigue was too much for them. There was no complaint on the part of any of us about the rarity of the atmosphere. The doctor attributed to this cause the fact that he could not go but a few yards at a time, near the summit, without resting; but I am inclined to think this was due to our exhaustion. My breathing did not seem to be in the least affected.

We were much disappointed not to have had more time to explore the summit of the mountain. We had, however, demonstrated the feasibility of making the ascent. Had

we started at dawn of day we should have had plenty of time for the journey. From what I saw I should say the mountain top was a ridge perhaps two miles in length and nearly half a mile in width, with an angle about half-way, and depressions between the angle and each end of the ridge which give to the summit the appearance of three small peaks as seen from the east or west. When viewed from north or south, a rounded summit is all that can be seen; while viewed from positions between the cardinal points of the compass, the mountain generally has the appearance of two peaks.

The night was very cold and clear after our return. We had some idea of making another ascent; but an investigation into the state of our provisions, together with the condition of the party generally, determined us to begin our return on the morning of the eighth day. The two soldiers had eaten all their bread but one cracker each. The doctor and I had enough left, so that by a redistribution we had four crackers each, with which to return over a space that had required seven days of travel coming. We, of course, expected to be a shorter time getting back; but let it be ever so short, our prospect for something to eat was proportionately much more limited. We had more meat than bread, thanks to the deer the Indian had killed, and we depended greatly on his killing more game for us going back; but this dependence, too, was cut off; the Indian was snow-blind, and needed our help to guide him. His groans disturbed us during the night, and what was our astonishment in the morning to find his eyelids closed with inflammation, and so swollen that he looked as if he had been in a free fight and got the worst of it. He could not have told a deer from a stump the length of his little old rifle.

Our camp was about 1,000 or 1,500 feet below the last visible shrub; water boiled at 199°, and, according to an approximate scale we had with us, this indicated an elevation of 7,000 feet. We estimated the highest peak to be over 12,000 feet high. I greatly regretted not being able to get the boiling-point on the top, but it was impossible to

have had a fire in such a wind as prevailed around the summit.

As we returned we had more leisure to examine and clearer weather to see the glacier than we had coming up. There was no median moraine; but an icy ridge parallel to the lateral moraines, and about midway between them, extending as far as we ascended the glacier. The lateral moraines were not continuous, but were interrupted by the walls of the spurs where they projected into the glacier; between these points the lateral moraines existed. The glacier sloped away from the ridge to the moraines, more or less sharply, and it was no easy matter to get off the ice, owing to the steepness of the moraine. The ice melted by reflection from the face of the moraine, and formed a difficult crevasse between it and the glacier. Bowlders of every shape and size were scattered over the face of the glacier. Large ones were propped up on pinnacles of ice; these were evidently too thick for the sun to heat through. The small bowlders were sunk more or less deeply, and surrounded by water in the hot sun; but they evidently froze fast again at night.

The noise produced by the glacier was startling and strange. One might suppose the mountain was breaking loose, particularly at night. Although, so far as stillness was concerned, there was no difference between day and night, at night the noise seemed more terrible. It was a fearful crashing and grinding that was going on, where the granite was powdered that whitened the river below, and where the bowlders were polished and partially rounded.

The great stillness and solitude were also very oppressive; no familiar sounds; nothing except the whistle of the animal before mentioned and the noise of the glacier's motion was to be heard, and if these had not occurred at intervals the solitude would have been still more oppressive. We were glad to get down again to the Nisqually, where we could hear its roar, and see its rushing waters. The other members of the party were so tired and worn, however, that they seemed to observe but little, and as we

were now on our homeward way, their thoughts were set only on our camp on the Mishawl, with its provisions and promise of rest.

Although suffering greatly from lack of food, the party made their way back to the point where they had left their horses on the Mashel River near the present site of Eatonville, in good time. The following paragraphs, which conclude the Lieutenant's account of the trip, show vividly the hardships attendant upon an expedition of such a nature:

Our first thought was of something to eat. I cautioned all about eating much at first; but from subsequent results am inclined to think my advice was not heeded. I contented myself with a half cracker, a little butter, and weak coffee; and an hour after, when I began to feel the beneficial effects of what I had eaten, I took a little more substantial meal, but refrained from eating heartily.

After a short rest we caught our horses, and the doctor and I rode into Steilacoom, where we arrived after a hard ride late in the afternoon. As we approached the post, we met on the road a number of the inhabitants with whom we were well acquainted, and who did not recognize us. Nor were we surprised when we got a glimpse of our faces in a glass. Haggard and sunburnt, nearly every familiar feature had disappeared. Since the loss of my hat, my head-dress was the sleeve of a red flannel shirt, tied into a knot at the elbow, with the point at the armpit for a visor. Our clothes were in rags; one of the doctor's pantaloon-legs had entirely disappeared, and he had improvised a substitute out of a coffee-sack. In our generally dilapidated condition none of our acquaintances recognized us until we got to the post. We passed for Indians until we arrived there, where we were received by the officers with a shout at our ludicrous appearance. They were all sitting under the oak-trees in front of quarters,

Santa Clara C
Free Library
San Jose, Cali

discussing what had probably become of us, and proposing means for our rescue, when we came up. I felt the effects of the trip for many days, and did not recover my natural condition for some weeks. The doctor and I went to the village next morning, where the people were startled at our emaciated appearance. We found that the doctor had lost twenty-one pounds in weight in fourteen days, and I had lost fourteen pounds in the same time. The doctor, while we were in the village, was taken with violent pains in his stomach, and returned to his post quite sick. He did not recover his health again for three months.

The two soldiers went into the hospital immediately on their return, and I learned that for the remainder of their services they were in the hospital nearly all the time. Four or five years after, Carroll applied to me for a certificate on which to file an application for a pension, stating that he had not been well since his trip to the mountain. The Indian had an attack of gastritis, and barely escaped with his life after a protracted sickness. I attribute my own escape from a lingering illness to the precautions I took in eating when satisfying the first cravings of hunger, on our return to camp.

We are not likely to have any competitors in this attempt to explore the summit of Mount Rainier. Packwood and McAllister, two citizens of Pierce County, Washington Territory, explored up the Nisqually, and crossed over to the head of the Cowlitz River, and thence by what was called Cowlitz Pass (since called Packwood Pass), to the east side of the mountains, searching for a trail to the mining regions of the upper Columbia. More recently, surveyors in the employ of the Pacific Railroad Company have been surveying through the same route for a railway passage.

When the locomotive is heard in that region some day, when American enterprise has established an ice-cream saloon at the foot of the glacier, and sherry-cobblers may be had at twenty-five cents half-way up to the top of the mountain, attempts to ascend that magnificent snow-peak

will be quite frequent. But many a long year will pass away before roads are sufficiently good to induce any one to do what we did in the summer of 1857.

Although Lieutenant Kautz considered that he reached the summit, his own statement, "Finally we reached what may be called the top, for although there were points higher yet the mountain spread out comparatively flat and it was much easier to get along," gives evidence that he did not. From his description it is likely that he was turned back by the ice walls, still present, at about 12,000 feet elevation. In fact, he estimates the top as being about 12,000 feet above sea level.

The route attempted by this first climbing party has since been successfully negotiated by mountaineers but it proved a long and rather difficult climb.

No doubt Lieutenant Kautz would have reached the actual summit of the mountain had time and the physical condition of the party permitted. As it was, the peak still towered some 2,000 feet above him although he did not know it.

The "mountain sheep" which Lieutenant Kautz found inhabiting burrows in the ground were indeed strange beasts. In reality the little animals were marmots, but they do not have split hoofs. The tracks were those of the mountain goat. Both animals are still quite abundant in the region of Kautz's former camp.

A glacier on the southern side of the peak has been named in honor of Lieutenant Kautz. The stream which flows from it, Kautz Creek, is crossed on the Nisqually road midway between the Park Entrance and Longmire Springs.

It remained for General Hazard Stevens and Mr.

P. B. Van Trump to make the first successful ascent 13 years later.

The following vivid account of the ascent made on August 17, 1870, by General Stevens and Mr. Van Trump was written by General Stevens, and appeared originally under the title of "The Ascent of Mount Takhoma" in the "Atlantic Monthly" for November, 1876. Only that portion pertaining to the actual climb from Bear Prairie, three miles southeast of Longmire Springs, to the summit and back to the base camp near Sluiskin Falls at the head of Paradise Valley, is recorded.

Punctual to promise, Sluiskin rode up at noon mounted upon a stunted Indian pony, while his squaw and papooses followed upon another even more puny and forlorn. After devouring an enormous dinner, evidently compensating for the rigors of a long fast, in reply to our inquiries he described the route he proposed to take to Takhoma. Pointing to the almost perpendicular height immediately back or east of our camp, towering three thousand feet or more overhead, the loftiest mountain in sight, "We go to the top of that mountain today," said he, "and tomorrow we follow along the high, backbone ridge of the mountains, now up, now down, first on one side and then on the other, a long day's journey, and at last, descending far down from the mountains into a deep valley, reach the base of Takhoma." Sluiskin illustrated his Chinook with speaking signs and pantomime. He had frequently hunted the mountain sheep upon the snow fields of Takhoma, but had never ascended to the summit. It was impossible to do so, and he put aside as idle talk our expressed intention of making the ascent.

We had already selected the indispensable articles for a week's tramp, a blanket apiece, the smallest coffee-pot and frying-pan, a scanty supply of bacon, flour, coffee, etc., and had made them up into suitable packs of forty pounds

each, provided with slings like a knapsack, and had piled together under the lee of a huge fallen trunk our remaining goods. Longmire, who although impatient to return home, where his presence was urgently needed, had watched and directed our preparations during the forenoon with kindly solicitude, now bade us good-by; mounted on one mule and leading the other, he soon disappeared down the trail on his lonely, homeward way. He left us the little pack-horse, thinking it would be quite capable of carrying our diminished outfit after our return from Takhoma.

Sluiskin led the way. The load upon his shoulders was sustained by a broad band, passing over his head, upon which his heavy, brass-studded rifle, clasped in both hands, was posed and balanced. Leaving behind the last vestige of trail, we toiled in single file slowly and laboriously up the mountain all the afternoon. The steepness of the ascent in many places required the use of both hand and foot in climbing, and the exercise of great caution to keep the heavy packs from dragging us over backwards. Coleman lagged behind from the start, and at intervals his voice could be heard hallooing and calling upon us to wait. Towards sunset we reached a level terrace, or bench, near the summit, gladly threw off our packs, and waited for Coleman, whom we supposed, could not be far below. He not appearing, we hallooed again and again. No answer! We then sent Sluiskin down the mountain to his aid. After an hour's absence the Indian returned. He had descended, he said, a long distance, and at last caught sight of Coleman. He was near the foot of the mountain, had thrown away his pack, blankets and all, and was evidently returning to camp. And Sluiskin finished his account with expressions of contempt for the "cultus King George man." What was to be done? Coleman carried in his pack all our bacon, our only supply of meat, except a few pounds of dried beef. He also had the barometer, the only instrument that had survived the jolts and tumbles of our rough trip. But, on the other hand, he had been a clog upon our march from the outset. He was evidently too infirm to endure the

toil before us, and would not only be unable to reach, still less ascend Takhoma, but might even impede and frustrate our own efforts. Knowing that he would be safe in camp until our return, we hastily concluded to proceed without him, trusting to our rifles for a supply of meat.

Sluiskin led us along the side of the ridge in a southerly direction for two miles farther, to a well-sheltered, grassy hollow in the mountain-top, where he had often previously encamped. It was after dark when we reached this place. The usual spring had gone dry, and, parched with thirst, we searched the gulches of the mountain-side for water an hour, but without success. At length the writer, recalling a scanty rill which trickled across their path a mile back, taking the coffee-pot and large canteen, retraced his steps, succeeded in filling these utensils after much fumbling in the dark and consequent delay, and returned to camp. He found Van Trump and the Indian, anxious at the long delay, mounted on the crest of the ridge some two hundred yards from camp, waving torches and shouting lustily to direct his steps. The mosquitoes and flies came in clouds, and were terribly annoying. After supper of coffee and bread, we drank up the water, rolled ourselves in our blankets, and lay down under a tree with our flags floating from under the boughs overhead. Hot as had been the day, the night was cold and frosty, owing, doubtless, to the altitude of our camp.

At the earliest dawn next morning we were moving on without breakfast, and parched with thirst. Sluiskin led us in a general course about north-northeast, but twisting to nearly every point of the compass, and climbing up and down thousands of feet from mountain to mountain, yet keeping on the highest backbone between the headwaters of the Nisqually and Cowlitz rivers. After several hours of this work we came to a well-sheltered hollow, one side filled with a broad bed of snow, at the foot of which nestled a tiny, tranquil lakelet, and gladly threw off our heavy packs, assuaged our thirst, and took breakfast,—bread and coffee again. Early as it was, the chill of the frosty

night still in the air, the mosquitoes renewed their attacks, and proved as innumerable and vexatious as ever.

Continuing our march, we crossed many beds of snow, and drank again and again from the icy rills which flowed out of them. The mountains were covered with stunted mountain-ash and low, stubby firs with short, bushy branches, and occasionally a few pines. Many slopes were destitute of trees but covered with luxuriant grass and the greatest profusion of beautiful flowers of vivid hues. This was especially the case with the southern slopes, while the northern sides of the mountains were generally wooded. We repeatedly ate berries, and an hour afterwards ascended to where berries of the same kind were found scarcely yet formed. The country was much obscured with smoke from heavy fires which had been raging on the Cowlitz the last two days. But when at length, after climbing for hours an almost perpendicular peak,—creeping on hands and knees over loose rocks, and clinging to scanty tufts of grass where a single slip would have sent us rolling a thousand feet down to destruction—we reached the highest crest and looked over, we exclaimed that we were already well repaid for all our toil. Nothing can convey an idea of the grandeur and ruggedness of the mountains. Directly in front, and apparently not over two miles distant, although really twenty, old Takhoma loomed up more gigantic than ever. We were far above the level of the lower snow-line on Takhoma. The high peak upon which we clung seemed the central core or focus of all the mountains around, and on every side we looked down vertically thousands of feet, deep down into vast, terrible defiles, black and fir-clothed, which stretched away until lost in the distance and smoke. Between them, separating one from another, the mountain-walls rose precipitously and terminated in bare, columnar peaks of black basaltic or volcanic rocks, as sharp as needles. It seemed incredible that any human foot could have followed out the course we came, as we looked back upon it.

After a few hours more of this climbing, we stood upon the summit of the last mountain-ridge that separated us

from Takhoma. We were in a saddle of the ridge; a lofty peak rose on either side. Below us extended a long, steep hollow or gulch filled with snow, the farther extremity of which seemed to drop off perpendicularly into a deep valley or basin. Across this valley, directly in front, filling up the whole horizon and view with an indescribable aspect of magnitude and grandeur, stood the old leviathan of mountains. The broad, snowy dome rose far among and above the clouds. The sides fell off in vertical steeps and fearful black walls of rock for a third of its altitude; lower down, vast, broad, gently sloping snow-fields surrounded the mountain, and were broken here and there by ledges or masses of the dark basaltic rock protruding above them. Long, green ridges projected from this snow-belt at intervals, radiating from the mountain and extending many miles until lost in the distant forests. Deep valleys lay between these ridges. Each at its upper end formed the bed of a glacier, which closed and filled it up with solid ice. Below the snow-line bright green grass with countless flowers, whose vivid scarlet, blue, and purple formed bodies of color in the distance, clothed the whole region of ridges and valleys, for a breadth of five miles. The beautiful balsam firs, about thirty feet in height, and of a purple, dark-green color, stood scattered over the landscape, now singly, now in groves, and now in long lines, as though planted in some well-kept park. Farther down an unbroken fir forest surrounded the mountain and clad the lower portions of the ridges and valleys. In every sheltered depression or hollow lay beds of snow with tiny brooks and rivulets flowing from them. The glaciers terminated not gradually, but abruptly, with a wall of ice from one to five hundred feet high, from beneath which yeasty torrents burst forth and rushed roaring and tumbling down the valleys. The principal of these, far away on our left front, could be seen plunging over two considerable falls, half hidden in the forest, while the roar of waters was distinctly audible.

At length we cautiously descended the snow-bed, and,

climbing at least fifteen hundred feet down a steep but ancient land-slide by means of the bushes growing among the loose rocks, reached the valley, and encountered a beautiful, peaceful, limpid creek. Van Trump could not resist the temptation of unpacking his bundle, selecting one of his carefully preserved flies, and trying the stream for trout, but without a single rise. After an hour's rest and a hearty repast we resumed our packs, despite Sluiskin's protests, who seemed tired out with his arduous day's toil and pleaded hard against traveling farther. Crossing the stream, we walked through several grassy glades, or meadows, alternating with open woods. We soon came to the foot of one of the long ridges already described, and ascending it followed it for several miles through open woods, until we emerged upon the enchanting emerald and flowery meads which clothe these upper regions. Halting upon a rising eminence in our course, and looking back, we beheld the ridge of mountains we had just descended stretching from east to west in a steep, rocky wall; a little to the left, a beautiful lake, evidently the source of the stream just crossed, which we called Clear Creek, and glimpses of which could be seen among the trees as it flowed away to the right, down a rapidly descending valley along the foot of the lofty mountain-wall. Beyond the lake again, still farther to the left, the land also subsided quickly. It was at once evident that the lake was upon a summit, or divide, between the waters of the Nisqually and Cowlitz rivers. The ridge which we were ascending lay north and south, and led directly up to the mountain.

We camped, as the twilight fell upon us, in an aromatic grove of balsam firs. A grouse, the fruit of Sluiskin's rifle, broiled before the fire, and impartially divided gave a relish to the dry bread and coffee. After supper we reclined upon our blankets in front of the bright, blazing fire, well satisfied. The Indian, when starting from Bear Prairie, had evidently deemed our intention of ascending Takhoma too absurd to deserve notice. The turning back of Mr. Coleman only deepened his contempt for our prowess. But

his views had undergone a change with the day's march. The affair began to look serious to him, and now in Chinook, interspersed with a few words of broken English and many signs and gesticulations, he began a solemn exhortation and warning against our rash project.

Takhoma, he said, was an enchanted mountain, inhabited by an evil spirit, who dwelt in a fiery lake on its summit. No human being could ascend it or even attempt its ascent and survive. At first, indeed, the way was easy. The broad snow-fields, over which he had so often hunted the mountain goat, interposed no obstacle, but above them the rash adventurer would be compelled to climb up steeps of loose, rolling rocks, which would turn beneath his feet and cast him headlong into the deep abyss below. The upper snow-slopes, too, were so steep that not even a goat, far less a man, could get over them. And he would have to pass below lofty walls and precipices whence avalanches of snow and vast masses of rocks were continually falling; and these would inevitably bury the intruder beneath their ruins. Moreover, a furious tempest continually swept the crown of the mountain, and the luckless adventurer, even if he wonderfully escaped the perils below would be torn from the mountain and whirled through the air by this fearful blast. And the awful being upon the summit, who would surely punish the sacrilegious attempt to invade his sanctuary,—who could hope to escape his vengeance? Many years ago, he continued, his grandfather, a great chief and warrior, and a mighty hunter, had ascended part way up the mountain, and had encountered some of these dangers, but he fortunately turned back in time to escape destruction; and no other Indian had ever gone so far.

Finding that his words did not produce the desired effect, he assured us that, if we persisted in attempting the ascent, he would wait three days for our return, and would then proceed to Olympia and inform our friends of our death; and he begged us to give him a paper (a written note) to take to them, so that they might believe his story. Sluiskin's manner during this harangue was earnest in the ex-

treme, and he was undoubtedly sincere in his forebodings. After we had retired to rest, he kept up a most dismal chant or dirge, until late in the night. The dim, white, spectral mass towering so near, the roar of the torrents below us, and the occasional thunder of avalanches, several of which fell during the night, added to the weird effect of Sluiskin's song.

The next morning we moved two miles farther up the ridge and made camp in the last clump of trees, quite within the limit of perpetual snow. Thence, with snow-spikes upon our feet and Alpine staff in hand,we went up the snow fields to reconnoiter the best line of ascent. We spent four hours, walking fast, in reaching the foot of the steep, abrupt part of the mountain. After carefully scanning the southern approaches, we decided to ascend on the morrow by a steep, rocky ridge that seemed to lead up to the snowy crown.

Our camp was pitched on a high knoll crowned by a grove of balsam firs near a turbulent glacial torrent. About nine o'clock, after we had lain down for the night, the firs round our camp took fire and suddenly burst out in a vivid conflagration. The night was dark and windy, and the scene—the vast, dim outlines of Takhoma, the white snow-fields, the roaring torrent, the crackling blaze of the burning trees—was strikingly wild and picturesque.

In honor of our guide we named the cascade at our feet Sluiskin's Falls; the stream we named Glacier Creek, and the mass of ice whence it derives its source we styled the Little Nisqually Glacier.

Before daylight the next morning, Wednesday, August 17, 1870, we were up and had breakfasted, and at six o'clock we started to ascend Takhoma. Besides our Alpine staffs and creepers, we carried a long rope, an ice-axe, a brass plate inscribed with our names, our flags, a large canteen, and some luncheon. We were also provided with gloves, and green goggles for snow-blindness, but found no occasion to use the latter. Having suffered much from the heat of the sun since leaving Bear Prairie, and being

satisfied from our late reconnoissance that we could reach the summit and return on the same day, we left behind our coats and blankets. In three hours of fast walking we reached the highest point of the preceding day's trip, and commenced the ascent by the steep, rocky ridge already described as reaching up to the snowy dome. We found it to be a very narrow, steep, irregular backbone, being solid rock, while the sides were composed of loose broken rocks and débris. Up this ridge, keeping upon the spine when possible, and sometimes forced to pick our way over the loose and broken rocks at the sides, around columnar masses which we could not directly climb over, we toiled for five hundred yards, ascending at an angle of nearly forty-five degrees. Here the ridge connected, by a narrow neck or saddle, with a vast square rock, whose huge and distinct outline can be clearly perceived from a distance of twenty-five miles. This, like the ridge, is a conglomerate of basalt and trap, in well-defined strata, and is rapidly disintegrating and continually falling in showers and even masses of rocks and rubbish, under the action of frost by night and melting snow by day. It lies embedded in the side of the mountain, with one side and end projected and overhanging deep, terrible gorges, and it is at the corner or junction of these two faces that the ridge joined it at a point about a thousand feet below its top. On the southern face the strata were inclined at an angle of thirty degrees. Crossing by the saddle from the ridge, despite a strong wind which swept across it, we gained a narrow ledge formed by a stratum more solid than its fellows, and creeping along it, hugging close to the main rock on our right, laboriously and cautiously continued the ascent. The wind was blowing violently. We were now crawling along the face of the precipice almost in mid-air. On the right the rock towered far above us perpendicularly. On the left it fell sheer off, two thousand feet, into a vast abyss. A great glacier filled its bed and stretched away for several miles, all seamed or wrinkled across with countless crevasses. We crept up and along the ledge, not of solid, sure

rock, but one obstructed with the loose stones and débris which were continually falling from above, and we trod on the upper edge of a steep slope of this rubbish, sending the stones at every step rolling and bounding into the depth below. Several times during our progress showers of rocks fell from the precipice above across our path, and rolled into the abyss, but fortunately none struck us.

Four hundred yards of this progress brought us to where the rock joined the overhanging edge of the vast névé or snow-field that descended from the dome of the mountain and was from time to time, as pressed forward and downward, breaking off in immense masses, which fell with a noise as of thunder into the great canyon on our left. The junction of rock and ice afforded our only line of ascent. It was an almost perpendicular gutter, but here our ice-axe came into play, and by cutting steps in the ice and availing ourselves of every crevice or projecting point of the rock, we slowly worked our way up to two hundred yards higher. Falling stones were continually coming down, both from the rock on our right and from the ice in front, as it melted and relaxed its hold upon them. Mr. Van Trump was hit by a small one, and another struck his staff from his hands. Abandoning the rock, then, at the earliest practicable point, we ascended directly upon the ice, cutting steps for a short distance, until we reached ice so corrugated, or drawn up in sharp pinnacles, as to afford a foothold. These folds or pinnacles were about two or three feet high, and half as thick, and stood close together. It was like a very violent chop sea, only the waves were sharper. Up this safe footing we climbed rapidly, the side of the mountain becoming less and less steep, and the ice-waves smaller and more regular, and, after ascending about three hundred yards, stood fairly upon the broad dome of mighty Takhoma. It rose before us like a broad, gently sweeping headland of dazzling white, topped with black, where the rocky summit projected above the névé. Ascending diagonally towards the left we continued our course. The snow was hard and firm under foot, crisp and

light for an inch or two, but solidified into ice a foot or less beneath the surface. The whole field was covered with the ice-waves already described, and intersected by a number of crevasses which we crossed at narrow places without difficulty. About half-way up the slope, we encountered one from eight to twenty feet wide and of profound depth. The most beautiful vivid emerald-green color seemed to fill the abyss, the reflection of the bright sunlight from side to side of its pure ice walls. The upper side or wall of the crevasse was some twelve feet above the lower, and in places overhung it, as though the snow-field on the lower side had bodily settled down a dozen feet. Throwing a bight of the rope around a projecting pinnacle on the upper side, we climbed up, hand over hand, and thus affected a crossing. We were now obliged to travel slowly, with frequent rests. In that rare atmosphere, after taking seventy or eighty steps, our breath would be gone, our muscles grew tired and strained, and we experienced the sensations of extreme fatigue. An instant's pause, however, was sufficient to recover strength and breath, and we would start again. The wind, which we had not felt while climbing the steepest part of the mountain, now again blew furiously, and we began to suffer from the cold. Our course,—directed still diagonally towards the left, thus shunning the severe exertion of climbing straight up the dome, although at an ordinary altitude the slope would be deemed easy,—brought us first to the southwest peak. This is a long, exceedingly sharp, narrow ridge, springing out from the main dome for a mile into mid-air. The ridge affords not over ten or twelve feet of foothold on top, and the sides descend almost vertically. On the right side the snow lay firm and smooth for a few feet on top, and then descended in a steep, unbroken sheet, like an immense, flowing curtain, into the tremendous basin which lies on the west side of the mountain between the southern and northern peaks, and which is inclosed by them as by two mighty arms. The snow on the top and left crest of the ridge was broken into high, sharp pinnacles, with cracks and fissures extend-

ing to the rocks a few feet below. The left side, too steep for the snow to lie on, was vertical, bare rock. The wind blew so violently that we were obliged to brace ourselves with our Alpine staffs and use great caution to guard against being swept off the ridge. We threw ourselves behind the pinnacles or into the cracks every seventy steps, for rest and shelter against the bitter, piercing wind. Hastening forward in this way along the dizzy, narrow, and precarious ridge, we reached at length the highest point. Sheltered behind a pinnacle of ice we rested a moment, took out our flags and fastened them upon the Alpine staff, and then, standing erect in the furious blast, waved them in triumph with three cheers. We stood a moment upon that narrow summit, bracing ourselves against the tempest to view the prospect. The whole country was shrouded in a dense sea of smoke, above which the mountain towered two thousand feet in the clear, boundless ether. A solitary peak far to the southeast, doubtless Mount Adams, and one or two others in the extreme northern horizon, alone protruded above the pall. On every side of the mountain were deep gorges falling off precipitously thousands of feet, and from these the thunderous sound of avalanches would rise occasionally. Far below were the wide-extended glaciers already described. The wind was now a perfect tempest, and bitterly cold; smoke and mist were flying about the base of the mountain, half hiding, half revealing its gigantic outlines; and the whole scene was sublimely awful.

It was now five P.M. We had spent eleven hours of unremitted toil in making the ascent, and, thoroughly fatigued, and chilled by the cold, bitter gale, we saw ourselves obliged to pass the night on the summit without shelter or food, except our meager lunch. It would have been impossible to descend the mountain before nightfall, and sure destruction to attempt it in darkness. We concluded to return to a mass of rocks not far below, and there pass the night as best we could, burrowing in the loose débris.

The middle peak of the mountain, however, was evi-

dently the highest, and we determined to first visit it. Retracing our steps along the narrow crest of Peak Success, as we named the scene of our triumph, we crossed an intervening depression in the dome, and ascended the middle peak, about a mile distant and two hundred feet higher than Peak Success. Climbing over a rocky ridge which crowns the summit, we found ourselves within a circular crater two hundred yards in diameter, filled with a solid bed of snow, and inclosed with a rim of rocks projecting above the snow all around. As we were crossing the crater on the snow, Van Trump detected the odor of sulphur, and the next instant numerous jets of steam and smoke were observed issuing from the crevices of the rocks which formed the rim on the northern side. Never was a discovery more welcome! Hastening forward, we both exclaimed, as we warmed our chilled and benumbed extremities over one of Pluto's fires, that here we would pass the night, secure against freezing to death, at least. These jets were from the size of that of a large steampipe to a faint, scarcely perceptible emission, and issued all along the rim among the loose rocks on the northern side for more than half the circumference of the crater. At intervals they would puff up more strongly, and the smoke would collect in a cloud until blown aside and scattered by the wind, and then their force would abate for a time.

A deep cavern, extending into and under the ice, and formed by the action of heat, was found. Its roof was a dome of brilliant green ice with long icicles pendant from it, while its floor, composed of the rocks and débris which formed the side of the crater, descended at an angle of thirty degrees. Forty feet within its mouth we built a wall of stones, inclosing a space five by six feet around a strong jet of steam and heat. Unlike the angular, broken rocks met with elsewhere, within the crater we found well-rounded bowlders and stones of all sizes worn as smooth by the trituration of the crater as by the action of water. Nowhere, however, did we observe any new lava or other evidences of recent volcanic action excepting these issues

of steam and smoke. Inclosed within the rude shelter thus hastily constructed, we discussed our future prospects while we ate our lunch and warmed ourselves at our natural register. The heat at the orifice was too great to bear for more than an instant, but the steam wet us, the smell of sulphur was nauseating, and the cold was so severe that our clothes, saturated with the steam, froze stiff when turned away from the heated jet. The wind outside roared and whistled, but it did not much affect us, secure within our cavern, except when an occasional gust came down perpendicularly. However, we passed a most miserable night, freezing on one side, and in a hot steam-sulphur-bath on the other.

The dawn at last slowly broke, cold and gray. The tempest howled still wilder. As it grew light, dense masses of driven mist went sweeping by overhead and completely hid the sun, and enveloped the mountain so as to conceal objects scarce a hundred feet distant. We watched and waited with great anxiety, fearing a storm which might detain us there for days without food or shelter, or, worse yet, snow, which would render the descent more perilous, or most likely, impossible. And when, at nine A.M., an occasional rift in the driving mist gave a glimpse of blue sky, we made haste to descend. First, however, I deposited the brass plate inscribed with our names in a cleft in a large bowlder on the highest summit,—a huge mount of rocks on the east side of our crater of refuge, which we named Crater Peak,—placed the canteen alongside, and covered it with a large stone. I was then literally freezing in the cold, piercing blast, and was glad to hurry back to the crater, breathless and benumbed.

We left our den of refuge at length, after exercising violently to start the blood through our limbs, and, in attempting to pass around the rocky summit, discovered a second crater, larger than the first, perhaps three hundred yards in diameter. It is circular, filled with a bed of snow, with a rocky rim all around and numerous jets of steam issuing from the rocks on the northern side. Both craters

are inclined—the first to the west, and the latter to the east with a much steeper inclination, about thirty degrees. The rim of the second crater is higher, or the snow-field inside lower, than that of the first, and upon the east side rises in a rocky wall thirty feet above the snow within. From the summit we obtained a view of the northern peak, still partially enveloped in the driving mist. It appeared about a mile distant, several hundred feet lower than the center peak, and separated from it by a deeper, more abrupt depression or gap than that separating Crater and Success peaks. Like the latter, too, it is a sharp, narrow ridge springing out from the main mountain, and swept bare of snow on its summit by the wind. The weather was still too threatening, the glimpses of the sun and sky through the thick, flying scud were too few and fugitive, to warrant us in visiting this peak, which we named Peak Takhoma, to perpetuate the Indian name of the mountain.

Our route back was the same as on the ascent. At the steepest and most perilous point in descending the steep gutter where we had been forced to cut steps in the ice, we fastened one end of the rope as securely as possible to a projecting rock, and lowered ourselves down by it as far as it reached, thereby passing the place with comparative safety. We were forced to abandon the rope here, having no means of unfastening it from the rock above. We reached the foot of the rocky ledge or ridge, where the real difficulties and dangers of the ascent commenced, at 1:30 P.M., four and a half hours after leaving the crater. We had been seven and a half hours in ascending from this point to the summit of Peak Success, and in both cases we toiled hard and lost no time.

We now struck out rapidly and joyfully for camp. When nearly there Van Trump, in attempting to descend a snowbank without his creepers, which he had taken off for greater ease in walking, fell, shot like lightning forty feet down the steep incline, and struck among some loose rocks at its foot with such force as to rebound several feet into the air; his face and hands were badly skinned, and he

received some severe bruises and a deep, wide gash upon his thigh. Fortunately the camp was not far distant, and thither with great pain and very slowly he managed to hobble. Once there I soon started a blazing fire, made coffee, and roasted choice morsels of a marmot, Sluiskin having killed and dressed four of these animals during our absence. Their flesh, like the badger's, is extremely muscular and tough, and has a strong, disagreeable, doggy odor.

Towards the close of our repast, we observed the Indian approaching with his head down, and walking slowly and wearily as though tired by a long tramp. He raised his head as he came nearer, and, seeing us for the first time, stopped short, gazed long and fixedly, and then slowly drew near, eyeing us closely the while, as if to see whether we were real flesh and blood or disembodied ghosts fresh from the evil demon of Takhoma. He seemed both astonished and delighted to find us safe back, and kept repeating that we were strong men and had brave hearts: "Skookum tilicum, skookum tumtum." He expected never to see us again, he said, and had resolved to start the next morning for Olympia to report our destruction.

The small stream at the base of the Tatoosh range which Stevens named Clear Creek, has since been called Tatoosh Creek. It has its source in Reflection Lake. The climbers followed approximately the same route commonly followed by parties today and the "vast square rock" referred to is Gibraltar Rock. Glacier Creek and the Little Nisqually Glacier have since been changed to Paradise River and the Paradise Glacier. Peak Success, the first point of the summit to be reached, still bears the name given it by Stevens and Van Trump, although the highest point was changed by the Ingraham party in 1891 from Crater Peak to Columbia's Crest as it was thought at the time to be the highest point in America. The third of the summit peaks, named by Stevens and Van Trump Peak Tak-

homa, but not visited by them on account of the storm, was called by Bailey Willis in 1883, Liberty Cap, which name it still bears.

It is noticed that General Stevens uses the name of Takhoma in preference to Rainier. A note in the original article states:

> Tak-ho'ma or Ta-ho'ma, among the Yakimas, Klickitats, Puyallups, Nisquallys and allied tribes of Indians, is the generic term for Mountain, used precisely as we use the word "Mount," as Takhoma Wynatchie, or Mount Wynatchie. But they all designate Rainier simply as Takhoma or The Mountain, just as the Mountain men used to call it the "Old He."

The names of both Stevens and Van Trump have been generously bestowed upon natural features of the Park, Stevens Peak, Stevens Glacier, Van Trump Glacier and Van Trump Park being examples.

A few years after the memorable expedition of Stevens and Van Trump (1883), James Longmire, a pioneer of that old school who felt cramped for room if they had neighbors on more than one side of them, blazed a trail up the Nisqually Valley and located a mineral claim at the very base of the mountain. This claim inclosed a group of mineral springs now known as Longmire Springs.

With the blazing of this trail, which later grew into a rough wagon road and was extended as far as the terminus of the Glacier for the use of the ever-increasing numbers of visitors to the great peak, and the coming of numerous prospectors, who, lured on by the hope of a "strike," made their way to the very edge of the ice-dome, the mountain became widely known.

Largely through the efforts of such men as Professor I. C. Russell, Bailey Willis, and John Muir, the Govern-

ment realized the value of the area as a national asset and on March 2, 1899, by an act of Congress the Mount Rainier National Park was created.

Between the years 1908 and 1915 the Nisqually road was relocated and extended on into Paradise Valley, a remarkable feat, at the time, of highway engineering, executed in large part by Eugene Ricksecker, the engineer in charge.

Since the coming of the automobile and the construction of splendid approach roads, the popularity and likewise the development of the Park has increased by leaps and bounds.

Indians

There is little doubt that the Indians of the Pacific Northwest looked up to the great peak which towered majestically above them with mingled fear and reverence. It is true of any aboriginal people that what they cannot understand they fear and what they fear they worship. No wonder that the mighty mountain, clothed in ice and snow, with its subterranean fires which rumbled within and sometimes broke forth in flames and smoke, and its ever changing moods, answered the idea of God to the simple, imaginative mind of the Indian. By all the tribes within sight of its summit, this mighty peak, called by them Tahoma, Takoma, Takobet and various other names depending upon the tribal language which they spoke, was deemed a power to be feared and conciliated.

Although numerous individuals of a half dozen tribes and two distinct types are known to have lived on all sides of the mountain, the Indians have left little in the way of art, legend, or history. To the east beyond the crest of the Cascades were the Yakimas and Klick-

itats, a breed of lithe, upstanding, handsome men, great horsemen and famous runners, but who were perhaps too busy trying to eke out a living from a semi-arid country to develop any remarkable crafts. These came into the high mountains each season to gather wild berries and to hunt for mountain goat, deer, elk, and bear, but never to make permanent camps.

On the west, in the Puget Sound Basin, and toward the south were tribes of an entirely different type, squat, flat-faced canoe Indians who subsisted largely by spearing salmon and digging clams. These included such tribes as the Nisqually and the Puyallup with whom the first settlers on the Sound came into intimate contact and the Cowlitz farther to the south. These "Digger" Indians normally kept close to tide-water where living was without effort. Their huts were made of mats woven from rushes, their food was largely sea life, their implements and utensils fashioned from cedar bark and clam shells and their means of transportation dug-out canoes hewn from the western red cedar. Occasionally however they too advanced into the high valleys to gather berries and to dig Camas roots.

The writer has found no evidence of permanent residence within the confines of the National Park although a few stone implements used both in hunting and in domestic life have been picked up. Ben Longmire, son of the first settler, James Longmire, has told me that he has found flint arrow-heads above timberline in Van Trump Park where the Indians have been hunting the mountain goat, but the only sure evidence I have personally found, that the natives advanced so high on the peaks, is an obsidian arrow-head which I picked up in 1922 in a pumice bed, probably used in hunting goat, on the very tip of Plummer Peak in the Tatoosh Range.

(Photograph by Curtis Studio)

Yakima Chieftain

The Plains type of Indian typical of those inhabiting the region east of the Cascade Mountains

(Copyrighted by Asahel Curtis)

Makah Basket Carrier

Typical of the Clam digging, Puget Sound Indians

A brief account by General Hazard Stevens in his story of the first ascent describes these summer camps on the mountain as well as the Indians and the life they led:

The following day Longmire and I went down the canyon (from Bear Prairie just below Longmire Springs) to its junction with the Cowlitz River, in search of a band of Indians who usually made their headquarters at this point and among whom Longmire hoped to find some hunter familiar with the mountains who might guide us to the base of Takhoma. The tiny rivulet which we followed soon swelled to a large and furious torrent, and its bed filled nearly the whole bottom of the gorge. The mountains rose on each side precipitously and the traces of land slides which had gouged vast furrows down their sides were frequent. With extreme toil and difficulty, we made our way, continually wading the torrent, clambering over broken masses of rock which filled its bed, or clinging to the steep hillsides, and reached the Cowlitz at length after twelve miles of this fatiguing work, but only to find the Indian camp deserted. Further search, however, was rewarded by the finding of a rude shelter formed of a few skins thrown over a framework of poles, beneath which sat a squaw at work upon a half-dressed deer skin. An infant and a naked child of perhaps four years lay on the ground near the fire in front. Beside the lodge and quietly watching our approach, of which he alone seemed aware, stood a tall slender Indian, clad in buckskin shirt and leggins with a striped woolen breech-clout and a singular head garniture which gave him a fierce and martial appearance. This consisted of an old military cap, the visor thickly studded with brass-headed nails, while a large circular brass article, which might have been the top of an oil lamp, was fastened upon the crown. Several eagle feathers stuck in the crown and strips of fur sewed upon the sides completed the edifice, which notwithstanding its components, appeared imposing rather than ridiculous. A long Hudson

Bay gun, the stock also ornamented with brass-headed tacks, lay in the hollow of the Indian's shoulder.

He received us with great friendliness, yet not without dignity, shaking hands and motioning us to a seat beneath the rude shelter, while his squaw hastened to place before us suspicious-looking cakes of dried berries, apparently their only food. After a moderate indulgence in this delicacy, Longmire made known our wants. The Indian spoke fluently the Chinook jargon. He called himself "Sluiskin" and readily agreed to guide us to Rainier, known to him only as Takhoma, and promised to report at Bear Prairie the next day.

Sluiskin proved to be an Indian of

original and striking character. Leading a solitary life of hardships amidst these wilds, yet of unusual native intelligence, he had contrived, during rare visits to the settlements, to acquire the Chinook jargon, besides a considerable stock of English words, while his fund of general information was really wonderful. He was possessed of a shrewd, sarcastic wit, and, making no pretense to the traditional gravity of his race, did not scruple to use it freely. Yet beneath this he cherished a high sense of pride and personal independence. Although of the blood of the powerful and numerous Yakimas, who occupied the country just east of the Cascades, he disdained to render allegiance to them or any tribe, and undoubtedly regarded the superintendent of Indian affairs, or even the great White Father at Washington himself, with equal contemptuous indifference.

It is still the practice of the local Indians to come each season into the high valleys to gather quantities of blue huckleberries which they dry for food. The Indian of today, however, has lost much of his former picturesqueness. Although the women still carry their "papooses" in a shawl on their backs and use some very remarkable baskets made by their mothers from

the local Squaw grass, it is more common to see them arrive in closed cars than upon wiry mountain ponies, and although some of them still employ the Chinook jargon, or tribal dialects, typical American slang phrases are as frequently heard.

Although, as we have said, the red men left few material objects as evidence of their former occupation, names of Indian origin have been richly bestowed upon natural objects and places in the park, a practice far more in keeping with the policy of the National Park Service than that of bestowing the names of more or less obscure people, as so often happens.

A glance at the map reveals many such as: Nisqually, Cowlitz, Yakima, and Puyallup,—names of Indian tribes, that have been given to glaciers, rivers, and parks; Wapowety and Sluiskin, which honor the guides of Kautz and Stevens respectively; Owyhigh, a war chief of the Yakimas; and Quayemath, the chieftain who, trusting the whites, gave himself as hostage for his band, in one of the few Indian uprisings of the region. A day or so later old Quayemath was taken from the prison at Olympia and murdered by the boastful whites who had promised him safety. Such native words as Mowich, meaning deer; Ollala, berries; Tumtum, from the Chinook meaning heart; Mazama, the Indian word for mountain goat; and Tilicum, a Chinook jargon word for friend, have been given to lakes, streams, peaks, and ridges on the mountain. Indian Henry's Hunting Ground is so called for an old Indian who frequented the region. His real name, Sotolick, was unpronounceable by the whites so he was dubbed "Indian Henry" instead. Tatoosh, Ohanapecosh, Spukwush, Chenuis, Wahpenyao, Wauhaukaupauken, and Ipsut are Indian words of the meaning of which we are not certain.

BOOK II

THE NATIONAL PARK

CHAPTER IV

Description and Administration

Mount Rainier National Park is one of nineteen great natural, scenic playgrounds, belonging to the people and administered for them by the National Park Service under the Department of the Interior. It is the policy of the National Park Service to maintain these magnificent scenic areas as nearly as possible in their natural condition for all time to come, and we can hand down to future generations no finer heritages than these bits of God's great out-of-doors.

The Parks were set aside not only to preserve their natural scenic beauty, and the forests, flowers, and wild life they contain, but also for the use, observation, health, and pleasure of all the people. Because of this they are being made accessible to the people. New areas are being opened up by roads and trails, and hotels and camps are established that serve as stopping places for visitors.

It is the policy of the Service, however, not to overdevelop these areas, and large blocks of virgin country are to be left untouched except by mountain trails.

The National Parks are not only scenic preserves but forest and wild life preserves as well. The flower fields are protected, the forests will never fall before the axe, and animal and bird life is not only protected but encouraged in every possible way.

Mount Rainier is in western Washington, 40 miles due southeast from the city of Tacoma and 55 miles south by east from Seattle. It is not a part of the Cascade Range proper, but is a great volcanic cone much newer in formation which stands about 12 miles west of the Cascade summit line and is therefore entirely within the Pacific slope drainage system.

The Mount Rainier National Park is a rectangle approximately 18 miles square, of 207,360 acres. The actual base of the cone covers over 100 of the 324 square miles of area and stands almost in its center. About 250 square miles of the Park are covered with virgin timber containing some of the finest forests found anywhere on earth today.

The enforcement of the rules and regulations necessary for the protection and maintenance of this large area, used by many thousands of people each year, falls upon a Superintendent who resides and maintains his office within the Park and who is directly responsible to the Director of the National Park Service. The Superintendent is assisted in this work by a corps of National Park Rangers, men whose first duty is courtesy and service to the public; big, smiling, outdoor men who will go to any reasonable length to help the visitor enjoy his Park and to an equal length to bring offenders to justice. Fortunately for the Park occasion for the latter is rare.

Upon these men falls the pleasant duty of keeping constantly in contact with the visitors, patrolling the trails for fire and game protection, supervising the maintenance of trails and telephone lines, and a thousand-and-one similar duties that arise in the course of their work.

Visitors to the Park should feel that these men are there to help them enjoy their stay and that they are

their best source of information and advice, rather than that they are stern guardians of the law, constantly watching to catch possible transgressors. That is the only unpleasant part of their duty.

Aside from administering the Park, the duties of the Superintendent are multifarious; he must supervise all construction work which is in charge of a resident engineer and a construction foreman, make estimates of needed appropriations of money by Congress for the operation of the Park, compile statistics and reports, plan new development, hear and adjust complaints and differences, and at all times play the part of host to his thousands of guests.

A line of work more recently established, which aims to help the visitor enjoy more fully the natural features of the region by knowing more about them, is the free Nature Guide Service in charge of a Park Naturalist. This service makes available accurate information to the visitor by the placing of information bureaus with specially qualified men in charge, at convenient points, includes regular illustrated lectures on the natural features of the Park at the various centers, a weekly bulletin service, a reference library and a small educational museum, and various sorts of special service to those interested in studying the natural history of the Park. The Park Naturalist also has charge of the scientific research work that is carried on in connection with game and forest protection, and the educational work of the service.

Fortunately the National Park is completely surrounded by the Rainier National Forest which assures the perpetuation of the wonderful coniferous forest covering the region. The National Forests are administered by the United States Forest Service under the Department of Agriculture. Although the chief aim of

the National Forests is the production of timber for commercial use, later, they will always be administered along the lines of scientific forestry which demands that they be protected from fire and disease and that new forests be established where the old stands have been removed.

The National Forest Service also clearly recognizes the recreational value of the forests. Therefore, the Rainier National Forest not only protects the Park but adds to its usefulness by surrounding it with areas already developed with roads and trails that are open to the enjoyment of the people.

CHAPTER V

Scenic Features, Roads, and Trails

The chief scenic features of Mount Rainier National Park may be briefly summarized under five heads, namely: the major peak and surrounding mountains, the glaciers, the wild flowers, the forests, and the wild life. Of these, all but the "surrounding mountains" have been treated in detail elsewhere.

Many thousands of years ago, due no doubt to the shrinking of the earth's crust, a high plateau was pushed up forming a bulge on the surface of the earth which extended in a north and south direction from Alaska to Mexico. Through the processes of erosion this has been cut into the Cascade and Sierra Nevada ranges of mountains. Much more recently geologically, a series of volcanic cones has been built up by their own action, that is by successive lava flows, intermittent with more explosive eruptions that threw out great quantities of volcanic ash, along the general course of these mountains. Within the United States there are no less than a dozen such more or less dormant volcanoes, extending from Mount Baker near the Canadian line in Washington, to Mount Lassen in northern California. Some of these, like Mount Hood, were formed near the crest of the already existing range but others, Rainier among them, broke out several miles to one side of the crest. The crater of Mount Rainier lies

thirteen miles to the west of the summit of the Cascade Range. The cone was built up on an irregular plateau ranging from 2,000 to 5,000 feet above sea level between buttressing spurs of the main range.

These spurs, both of which are included within the National Park, are no insignificant ranges themselves, with numerous beautiful peaks of their own. Although they stand upwards of 7,000 feet in elevation they are dwarfs alongside the great volcanic cone which came years later to usurp their glory.

The Tatoosh Range

Flanking Mount Rainier on the south is the rugged Tatoosh Range, some six miles in length, extending from Stevens Peak, on the east, to Eagle Peak, on the west. The highest mountain of this range is Unicorn, 6,939 feet. All of these peaks afford splendid exercise for the mountain climber. Continuing this series toward the west is Satulick, Iron, Crystal, Ararat, and Mount Wow in the vicinity of Indian Henry's Hunting Ground.

The Tatoosh is of a hard volcanic rock which probably came across from the great lava flows of eastern Washington and Oregon before the Cascades were pushed up. Although cut into their present shape by ice and water, they were never covered by the glaciers of Rainier which flowed past the range on its east and west, cutting out the great valleys of the Cowlitz and the Nisqually. No doubt at the same time that the major peak was covered with ice, small tributary glaciers were found on these ranges. Remnants of these glaciers still remain on Pinnacle and Unicorn peaks, and on the Sluiskin Mountains to the north of Rainier.

The Northern Ranges

On the north another spur of the Cascades still remains in the presence of Sourdough Mountain, the Sluiskin and Mother Mountain ranges. These peaks are very similar in their history and geology to the Tatoosh Range although individual peaks differ greatly in character. Especially rugged are the Sluiskin Mountains composed of Chief Sluiskin on the east (7,015 feet elevation), Sluiskin's Squaw, and the Three Papooses. Across the canyon, cut by the Carbon Glacier, stand the Mother Mountains with Castle Rock the dominant feature. These are a continuation of the same spur in which stand the Sluiskin Mountains.

East Side

Standing between the summit of Rainier and the Cascades are several prominent landmarks. Little Tahoma, an almost unscalable crag, 11,117 feet high, is a remnant of the major peak which has withstood the chiseling of the Emmons and Ingraham Glaciers and gives one a clue to the original height and bulk of Rainier. Below Little Tahoma and beyond Panhandle Gap, stand the basaltic spurs known as the Cowlitz Chimneys and beyond them rise Double Peaks, Tamanos Mountain, and serrated Governor's Ridge. This region is crossed by both the East Side Trail and the Wonderland Trail. It is a wilderness inhabited by deer, bear, cougar, and mountain goat, that will likely not be disturbed by the whirr of motors, unless they be aeroplane motors, for many years to come. It is the present plan of the National Park Service to leave this, with the Grand Park and Natural Bridge sections to the north, a trail country for the ever increasing

brotherhood of outdoors men who delight in wandering away from the beaten path.

Roads

The approach to the southern and most extensively developed section of the National Park begins at the city of Tacoma, thence running south and east approximately 55 miles to the Nisqually Entrance. For 28 miles the railroad and highway, paralleling each other, run along the base of huge timbered bluffs which rise sheer from the prairie level, or through timbered copses and huddling firs that dot the landscape, mirroring themselves in the crystal water of many lakes.

At the foothills of the mountain the railroad and the highway really become canyon roads. From the top of King Hill, overlooking Ohop Valley, the highway affords a most inspiring view of the great mountain and its surrounding peaks and valleys. This point is about halfway to the Park entrance. After descending this hill the road begins rising, almost imperceptibly at first, toward the eternal snows on the mountain's dome. On all sides are mighty firs as yet barely touched by the lumbermen. Now and again the highway leads to the brink of canyons; gullies they are, compared to what come farther toward the clouds. Here the road turns suddenly on itself and in a twinkling is across the valley's floor. A few hundred yards and it begins again to climb, this time through fir forests a hundred times more splendid than were found before the Ohop was reached.

Presently the traveler finds himself looking down a sheer thousand feet to where the Nisqually River threads its way to the sea. This is the Nisqually Canyon. How the road ever came to wind its very

lip is one of the marvels that only the engineer can explain.

For seeming miles of breathless interest the road runs perilously above the canyon; then, presently, it plunges anew into the endless forests of fir and goes on and on, always gently climbing. The railroad ends at Ashford, 6 miles from the Park entrance. At this point motor stages pick up the travelers by rail.

A portion of the Rainier National Forest, 3 miles in width at this point, is crossed just before reaching Mount Rainier National Park, and then the Park entrance is reached, almost at the southwest corner of the Park. Here a huge log gate has been erected, and through this gate alone may comfortable entry be had to this portion of the mountain park with vehicles. Just inside the gate is a lodge, where the visitor must register; then on and on the road plunges, through timber so dense the earlier forests seem pigmy, with glimpses of the mountain breaking through ever and anon, and the sound of many rushing waters coming through the trees, until at a sudden turn an evidence of civilization presents itself in the form of the National Park Inn and Longmire Springs.

The mountain road really begins at Longmire Springs. By switchback and crooked twist it rises gradually into the clouds, doubling back and forth on itself far below, every foot revealing some new glory that beggars word description. After 5½ miles the way leads on to a bridge. At the left, 1,500 feet away, a huge wall of ice rears into the air. This is the terminus of Nisqually Glacier and the beginning of the Nisqually River.

From the glacier the road leads on, with devious windings and turnings, through scenery more glorious every yard, until finally, where eternal snows begin, it ends. This is Paradise Valley, with Paradise

Inn, Paradise Camp, and a public Automobile Camp nearby. Paradise Valley, beautiful itself, is the starting point for many wonderful foot and saddle trips.

Visitors coming by auto from Portland and points south find their shortest route to the National Park by turning to the east at a point a few miles south of Chehalis on the Pacific Highway. This road, which leads by Morton and Mineral, follows the canyon of the Cowlitz River and is quite as scenic as the approach road from Tacoma which it joins at Elbe 12 miles below the Park entrance.

On the north there are two entrances to the Park, the Carbon River at the northwest corner, 40 miles from Tacoma and 60 miles from Seattle; and the White River entrance at the northeast corner reached by way of Enumclaw over 39 miles of wonderful forest road. This entrance will serve the visitors from the east as soon as the last link of the McClellan Pass State highway, now under construction, is completed.

From Seattle, Tacoma, and other Puget Sound cities there are several routes that may be followed in reaching either the Carbon River or White River entrances to the Park.

While differing somewhat of course these approach roads are all beautiful. Leading out from the cities they follow the broad forest-rimmed valleys of glacier-born rivers. Ever above towers the great silver peak beckoning up and on. Gradually the prosperous farms give way to the forests of fir, and hemlock, and cedar as the valleys approach the foothills of Rainier and narrow to canyons. Up these deep, forest-filled gorges, with the swiftly flowing river on one hand and precipitous cliffs on the other, the roads lead to the entrances of the Park.

The White River Road leads to White River Camp, on a few miles to the Public Automobile Camp where a magnificent view of the peak is obtained, and terminates eight miles from the entrance near the end of the great Emmons Glacier, largest of all the ice rivers that flow from Rainier. This is an old mining road which has been improved by the Park Service. It originally extended to Glacier Basin at an elevation of 5,900 feet but the upper two miles are too steep for safe auto travel and have not been maintained except as a trail. Eventually this road will be extended up into Yakima Park and across the incomparable north side to connect with the Carbon River road, thus giving the people from the great Inland Empire east of the Cascades a magnificent drive through the Park on their way to the Coast cities.

The Carbon River road approaches by way of the canyon of the Carbon River and Fairfax. This road runs through wonderful stands of timber along a very easy grade to Cataract Creek, 8 miles above the Park entrance and a short distance below the terminus of the Carbon Glacier. At Ipsut Creek, 5 miles above the entrance, the West Side road turns up the creek, climbs by a series of switchbacks to Ipsut Pass, and continues on 43 miles to its junction with the Nisqually road on the south side at Tahoma Creek, 1 mile above the Nisqually entrance. When completed this road will be without doubt the most scenic mountain road in America. It passes through a 900-foot tunnel at Ipsut Pass and emerges almost on the shores of Mowich Lake, an emerald green mountain gem, lying in the cirque of a former glacier. Turning toward the ice-clad summit the road passes over Eagle Cliffs, skirts the North Mowich Glacier, and climbs the wooded canyon wall to Sunset Park with its score of lovely

lakes reflecting the golden sunset colors of the great mountain. This is the highest point on the road. For several miles it winds through beautiful flower-filled alpine meadows, with away to the west the dark blue waters of island-studded Puget Sound, and beyond the snowy Olympics shutting off a view of the Pacific Ocean. Beyond Sunset Park and Golden Lakes the road crosses the North Puyallup River below the hanging ice cascades of the Puyallup Glacier, climbs Klapatche Ridge for other broad views of Rainier and the great basin to the west, down cascading St. Andrews Creek to the South Puyallup River, up again to Round Pass near Lake George and down Tahoma Creek with its giant trees and colonies of beaver to the Nisqually road which leads to Longmire Springs and Paradise Valley, out by way of the Nisqually Canyon to the cities of the Sound.

Trails

Trails have been constructed within the Park with view to making the wonders of nature easily accessible, as well as to provide patrol routes for the protection of the forests and wild life. More than 200 miles of entrancing mountain trails provide access to the terminals of some 20 living glaciers, as many flower-filled mountain meadows, hundreds of beautiful lakes and peaks, deep box canyons, natural bridges, plunging waterfalls, and miles of ideal trout streams with countless pools and cascades.

About the more extensively used areas, such as Paradise Valley, there are numerous short trails offering ideal outings, from an hour to a day in length; and completely encircling the great dome, now high up on the crests, now deep down in the cool forests, swings

Natural Bridge

A span of basalt 200 feet long and 100 feet high on the North Loop Trail

(Photograph by L. D. Lindsley)

A Storm on the Mountain

A party with pack horses crossing the moraine of the Winthrop Glacier on the Wonderland Trail

the Wonderland Trail for a hundred miles, connecting up all the developed areas and affording access to the distant regions of the Park far from the realm of the motor car.

The Wonderland Trail

The one trail in the National Park that gives the traveler anything like an adequate, comprehensive view of the great volcano is this Wonderland Trail and it is well named. Every hour it opens to the fortunate visitor vistas and distant views, intimate glimpses of growing things, and sketches of wild animal life that to anyone mean hours spent in Wonderland—a natural God-made Wonderland of forest and snow, wild flower, field, and mighty cascade.

As no acquaintance with any subject would be deemed full and exhaustive until all sides of that subject had been scrutinized, so lovers of Mount Rainier cannot be said to have exhausted their subject until they have viewed it from the thirty-two points of the compass; then they will find that instead of exhausting its wonders thousands of new ones will be revealed to them each leading to others that may be had but for the search. A trip encircling the mountain offers a combination of wooded valley, park-land, plateau, snow and ice field, and of panoramic view not available to those going in on the north side or on the south side, and not excelled anywhere.

The changing aspects of the Great Peak as one goes from Paradise Park on the south, eastward or westward, around to Grand Park on the north, more than double the wonder and inspiration to be obtained on one side alone. (Gorham.)

And such contrasts;—for every mighty stream of cold blue ice there is a vast sunny park exuberant with multi-colored flowers; close beside the age old snowfields bloom the lilies for a day; an inch from the ground the yellow alpine mimulus lifts its head as proudly as the stupendous mass of rock and snow rears its lofty summit miles into the sky; the mountain and the flower each more wonderful for the other. (WINONA BAILEY.)

The entire round trip of approximately 100 miles may be made on foot or with horses in as little as a week's time, if one cares to hurry, but a summer could with profit be consumed. Two to three weeks allow one to make the trip leisurely with frequent one-day stops to enjoy choice bits of scenery.

Splendid leisurely trips of one week or less may be enjoyed by taking certain sections of the Wonderland Trail, as for instance starting at White River, crossing the north side by either the Mystic Lake or Grand Park trails and out at the Carbon; or from Paradise Valley to Ohanapecosh Hot Springs and on to White River by either the highline-Wonderland Trail route or the lower East-side Trail. With the four entrances to the Park and the system of trails connecting each, trips of any length desired may be made from any of the entrances.

In the following paragraphs the Wonderland Trail and the shorter trails of each section will be briefly described with special reference to the scenic features to be enjoyed and the time necessary to make the trip in a comfortable manner. To people not familiar with mountain trails the time required to make the trip either on foot or with horses will prove a better guide than the distance in miles as given, for visitors will find that a mile over steep rocky trail or over snow

and ice is not to be compared with a mile any place in developed country.

Longmire Springs to Paradise Valley (5.9 miles)

The trail leaves the Nisqually road at the first curve 200 yards above the Superintendent's office at Longmire (elevation 2,700 feet), and follows the Nisqually River to the mouth of Paradise River and then up the Paradise River past Carter Falls, Narada Falls, and Washington Cascades to Paradise Valley. For 5 miles of the way the trail leads through heavy forests coming out into the alpine meadows in lower Paradise Valley. This trail affords some fine views of the Tatoosh Range and is, for much of its way, in sight of cascading mountain streams.

Time required: up, 3 hours; down, 2 hours.

Paradise Inn is situated on the south side of Mount Rainier at an elevation of 5,400 feet.

Paradise Valley to Nickel Creek (10 miles)

Beginning at Paradise Inn the trail crosses Paradise Valley and Mazama Ridge, turns around Reflection Lake and Lake Louise, then down Stevens Canyon to its mouth and rounds the point of Stevens Ridge to the Cowlitz Box Canyon bridge. From the Canyon bridge to Nickel Creek is a little over a mile. Here by a beautiful stream is a good camp site. This trip affords splendid views of the lakes, the Tatoosh Range, Stevens Canyon, Martha Falls, and the Narrow Gorge of the Muddy Fork of the Cowlitz River, 200 feet deep and only 20 feet wide in places. Most of the way the trail leads through mountain meadows, old burns, and rocky canyons, through a country as different from the

and the towering crest of Little Tahoma and Mount Rainier always above. At least 4 hours should be allowed for this trip in either direction. Summerland, elevation 5,900 feet, provides ideal camp sites.

Summerland to Glacier Basin (11 miles)

Down Fryingpan Creek and around the lower end of Goat Island Mountain the trail runs for 6 miles through heavy forests to the White River and White River road. Crossing the river the road is followed to its terminus near the end of the Emmons Glacier. From here the trail follows up Inter-Glacier Creek to Glacier Basin, a high alpine meadow close to the mountain lying at an elevation of 5,900 feet. The way is through heavy forests and open parks and always along beautiful streams. Some unusual views of the Mountain and the peaks to the east are had. Some 5 hours are needed for this trip in either direction.

Glacier Basin to Mystic Lake (8 miles)

A long series of switchbacks carries the trail from Glacier Basin to the top of Burroughs Mountain where, at an elevation above 7,000 feet, at least one third of the Park and a hundred miles of the Cascades are spread out to the view, then down Granite Creek, through alpine meadows to the heavy forests alongside the Winthrop Glacier. From the terminal moraine of the Winthrop the trail climbs again through forests to the mountain park where beautiful Mystic Lake lies between Old Desolate and Mineral Mountain, directly north of Rainier's summit. Here, at an elevation of 5,800 feet, splendid camp sites and a shelter cabin are

available. Four hours should be allowed for this section of trail going in either direction.

Mystic Lake to Terminus of the Carbon Glacier (6 miles)

From Mystic Lake a low divide, which affords an unusual view of the north face of Rainier with Willis Wall the dominant feature, is crossed into Moraine Park. Leaving Moraine Park alongside the mighty Carbon Glacier the trail drops rapidly through the forests and along cliffs to the terminus of the Carbon which extends to a lower elevation than any other glacier in the United States (3,300 feet). Here the trail crosses below the ice and joins the Carbon River road. Several shelter cabins and splendid camp sites are to be had in the vicinity. As the trail is steep 4 to 5 hours should be allowed up, and 3 hours down.

Carbon Glacier to Spray Park and Mowich Lake (10 miles)

The Carbon River road ends at Cataract Creek, and here the trail turns up the creek, through heavy timber to Mist Park, then over rocky divides and snow fields at an elevation above 6,000 feet, into beautiful Spray Park, justly famous for its magnificent views and wonderful flower fields. Splendid camp sites at elevations around 5,500 feet are found in Spray Park. The trail leads on three miles past Spray Falls and through the forests to Mowich Lake, a body of water a mile long lying in an old glacial cirque. At Mowich Lake, elevation 4,900 feet, there is a shelter cabin, Ranger station, and splendid camp sites. Six to seven hours are not too much for this trip in the direction of

[Copyrighted by Asahel Curtis]

Mirror Lake, Indian Henry's Hunting Ground

Mowich Lake but less time is required down. From Mowich to the Carbon there is another trail, the Ipsut Pass Trail, 7 miles long, which reaches the Carbon road at the mouth of Ipsut Creek.

Mowich Lake to Sunset Park (12 miles)

From Mowich Lake to Round Pass near Lake George the Wonderland Trail and the West Side Trail are the same. From Mowich the trail drops on easy grades by long switchbacks through heavy forests to the North Mowich River, then after 0.5 of a mile of low cedar land crosses the South Mowich and climbs again by switchback through forests to the crest of the ridge with splendid views of the mountain and valley. Two miles farther is Sunset Park directly on the west side of the mountain with numerous small lakes aptly named the Golden Lakes. At Golden Lakes is a comfortable but small shelter cabin (elevation 5,000 feet), and numerous fine camp sites with views not only of Rainier but of the Puget Sound basin and the snow-clad Olympics away to the west. The time required for this trip in either direction is about 6 hours.

Sunset Park to St. Andrews Creek (11 miles)

The route from Sunset Park to St. Andrews Creek cabin is similar in many ways to the Mowich Lake-Sunset Park trail, passing down through forests to the North Puyallup River and climbing again to Klapatche Ridge which it rounds to St. Andrews Creek. Here, at an elevation of 3,900 feet, alongside a beautiful stream, is a small log shelter cabin for the use of visitors.

Near by the trail branches toward the mountain and climbs for 2 miles into Klapatche Park, which affords a view considered by many people the finest to be had in the reservation. Not only is the view of the major peak particularly inspiring but on clear days a wonderful panorama of the distant Olympics to westward makes the trip worth while. The time required in either direction between Sunset Park and St. Andrews Creek is about 5 hours. Excellent camp sites but no shelter are available in Klapatche Park, a one hour's climb above St. Andrews cabin.

St. Andrews Creek to Indian Henry's Hunting Ground (12 miles)

From the cabin the trail follows down St. Andrews Creek with its beautiful waterfalls to the South Puyallup River and up again to Round Pass where the trail branches to Lake George a mile and a half to the right. At Lake George is a Ranger station. Camping is permitted and the fishing is always good. From Round Pass the Wonderland Trail drops down to Tahoma Creek and turns toward the mountain following the creek for 2 miles where it crosses just below the Tahoma Glacier and climbs rapidly into the broad alpine meadow known as Indian Henry's. Here also is a Ranger station and shelter cabin with numerous camp sites and some interesting side trips. A half mile above the cabin are the Mirror Lakes which photographers consider afford the finest reflections of the peak to be had. A mile farther is Pyramid Peak and Pyramid Park. Beyond is a rugged backbone of rock leading to Peak Success, near the summit, known as Success Cleaver. Numerous ascents of the Mountain have been made by this route although it is an arduous

(Photograph by Asahel Curtis)

Summit Party Crossing a Crevasse on the Snow Dome

Santa Clara
Free Library
San Jose, Calif.

one. In the opposite direction from the cabin is Mount Ararat, a flat-topped knoll easily climbed which gives perhaps the finest panorama to be had in this vicinity. The views of Rainier, Mount Adams, Mount Hood, Mount St. Helens, and the Olympics are particularly fine. Elevation at Ranger station, 5,300 feet. Time required from St. Andrews Creek, about 6 hours; or, if the side trip is made to Lake George en route, about 2 hours longer.

Indian Henry's Hunting Ground to Longmire Springs (7 miles)

Soon after leaving Indian Henry's the trail turns around Iron Mountain, passes Squaw Lakes and dips down into the woods toward Kautz Creek, then climbs over Rampart Ridge through an old burn and down through 2 miles of heavy timber to Longmire Springs (elevation 2,700 feet), thus completing the entire circuit of the mountain. The Indian Henry trip is one of the most popular one-day trips taken from Longmire Springs. The time required from Longmire is about 4 hours but the return may easily be made in 3 hours. Thus, in a one-day trip ample time is allowed in which to enjoy lunch and the view before returning to Longmire.

The Ascent of Mount Rainier

There is a fascination in climbing a great mountain and beholding the world spread out at your feet that appeals strongly to every energetic man or woman. Of all the interesting trips to be made in Mount Rainier National Park the ascent to the summit of the great peak is by far the most wonderful, and would be the

most popular, but for the fact that comparatively few are physically able to accomplish it without undue fatigue. For those who plan to make the ascent the following notes by F. E. Matthes of the United States Geological Survey will be of interest:

The ascent of Mount Rainier is made ordinarily from Paradise Park, by what is known as the Gibraltar route. This is the route which Gen. Hazard Stevens and P. B. Van Trump selected for their pioneer climb in 1870. It has proven to be the safest and most convenient of all the routes by which the peak has been attacked.

Mountaineers of experience are agreed that Rainier is not an easy peak to conquer. The great altitude of its summit (14,408 feet above sea level) and the relatively low level of the region about its base (between 2,000 and 5,000 feet) combine to make the ascent exceedingly long and exhausting. Dangerously crevassed ice covers a large proportion of the mountain's flanks, and the rocky ridges between the glaciers are composed in part of treacherous, crumbling material. If you have set your ambition on making the ascent you should therefore realize at the outset that there is no choice of routes, and that if you should lose the beaten trail there would be little or no hope of your extricating yourself by another way. Several have lost their lives on the mountain, in every case men who ventured to make the climb unaccompanied by guides.

There are several reasons for securing the services of a competent guide. The route does not consist of a definitely marked path. It leads for miles over snow fields on which footprints melt away from one day to the next. Again, the rock climbing up the Cowlitz Cleaver and Gibraltar Rock is not altogether without hazard, and should not be attempted unaided by those inexperienced in alpine climbing.

It is to be recognized, further, that most people do not know how to handle themselves on a long and fatiguing

ascent. The common tendency is to rush eagerly at the start, and to use up the strength that is needed later for the really arduous part of the climb. The guide's function is not merely to show you the way, but to tell you how to climb, how fast to go, when to rest and to take nourishment, and to take care of you in case you are overcome with exhaustion or are taken with mountain sickness.

Finally, the exceeding fickleness of the weather conditions on the mountain must be taken into account. Only guides familiar with Rainier's varying moods can presume to foretell whether or no the day will turn out favorable for a climb. What to the uninitiated may look like harmless, fleecy vapors may be the forerunners of a sudden snowstorm which no one could expect to live through. A majority of those who have perished on the mountain have been overcome by storms of blizzard-like severity. Such storms occur even in midsummer, and are always attended by fierce gales, against which it is difficult to hold one's footing.

Paradise Inn, in Paradise Park, is the logical base from which to make the climb. It is situated near the timberline, at an altitude of 5,400 feet. Accommodations may there be had by the day or week; guides may be secured, and through them such necessaries as alpenstocks, amber glasses, calks, hobnails, and grease paint to protect the face from sunburn, may be obtained.

The start is made usually from Paradise Park in the afternoon, so that Camp Muir may be reached before dusk. Here, at an elevation of 10,000 feet, is a substantial stone cabin in which you may find shelter from wind or storm. This cabin was built by the Government and is open to the use of all. It is equipped with spring bunks and a limited supply of blankets. The Rainier National Park Company provides mattresses and blankets for parties that make the trip under the leadership of their guides. The camp is situated some 4,000 feet above the highest vegetation. Provisions and fuel must be carried up from Paradise Inn and water is obtained by melting snow. The accommo-

dations are of the simplest character, but enable you to get a night's rest after having climbed 4,600 feet, and to start early the following morning, refreshed, for the remaining and more difficult climb of 4,400 feet to the summit. Camp Muir is located in a saddle at the base of a narrow rock spur known as the Cowlitz Cleaver.

The ascent of the Cowlitz Cleaver will tax your strength, being mostly over rough, angular blocks of lava. By 8 o'clock, as a rule, the base of Gibraltar Rock is reached. A narrow ledge is followed along the face of the cliff, part of the way overhung by rock masses and huge icicles, and this ledge leads to the base of a narrow chute between the ice cascades of the upper Nisqually Glacier and the body of Gibraltar. This chute offers the most serious difficulties in the ascent. Ropes are usually suspended from the cliffs, whereby you may assist yourself upward, the footing being as a rule precarious. It is advisable to move one at a time, as there is ever danger of those below being injured by fragments of rock or ice dislodged by those above. The ascent and descent of the chute are therefore inevitably time-consuming. Ordinarily the saddle above Gibraltar (12,679 feet) is not reached until 10 o'clock.

From Gibraltar on there remains only a long snow slope to the summit, but its ascent is generally very wearying, both on account of the altitude and the rough going. Almost every year new gaping crevasses develop that test the skill of the most experienced guides. Freshly fallen snow may be so deep that one flounders in it up to the waist, or else the old firm snow may be melted out into so-called honeycombs a foot or several feet deep, so that every step requires considerable exertion.

The rim of the south crater usually is reached before noon. It is always bare of snow, and shelter from the high gales may be sought behind the great lava blocks on the rim. Records in metal cases are kept here in which the climbers may inscribe their names.

The crater is deeply filled with snow and may be traversed without risk; but care should be taken near the edges, as the

(Photograph by Rounds)

Camp Muir

A stone shelter cabin at 10,000 feet elevation where mountaineers may spend the night, on the long climb to the summit of the peak

snow there is hollowed out in caverns by the steam jets which rise from beneath. Those who have the strength should go on to Columbia Crest, the snow dome that constitutes the highest summit of the mountain. The return to Paradise Inn is easily made in five or six hours, but extreme caution is necessary in the descent from Gibraltar, as the danger of slipping is even greater than on the ascent.

The climb is made occasionally in a night and a day, the party leaving Paradise Park about 10 or 11 o'clock at night, reaching Camp Muir for an early breakfast, and completing the trip during the day. This involves a continuous climb of about 9,000 feet, which is beyond the endurance of most climbers.

In conclusion, a word of caution to the over-ambitious. The ascent is so long and the altitude gained so high that only those who have prepared themselves by preliminary shorter climbs can hope to accomplish the feat with anything like genuine enjoyment. Altogether too many travelers attempt to make the ascent immediately upon arrival from the city, without permitting their hearts and lungs to become accustomed to the rarified air of the higher altitudes, and without toughening their muscles for the great task. As a consequence they either come back exhausted to the verge of collapse or else they fail altogether in the undertaking. And there is unfortunately more than one case on record of persons who have permanently injured their health by such ill-considered proceeding.

It is advisable upon arrival to spend several days—the more the better—in climbing about at lesser altitudes. A favorite try-out is an ascent of Pinnacle Peak, on the Tatoosh Range, which stands only 1,600 feet above Paradise Valley. It affords good training in every sort of climbing you will be called upon to do in conquering the main peak.

Moderation in diet and avoidance of heavy food are precautions that cannot be too urgently recommended. Bear in mind that the ascent involves athletic work of the most heroic kind, and that such work is not to be undertaken on

an over-generous or unbalanced diet. Before starting on the ascent do not indulge in any fried food, pork, veal, hot breads, hot cakes, or heavy pastry. Abstain, if possible, from coffee and tobacco. At high altitudes the heart, being accustomed to greater atmospheric pressure, beats with needless vigor, and is better off without stimulants. Spirituous liquor is taboo, as in any other kind of athletic training. Vegetables, raw and cooked, lean meat in small quantity, breakfast foods, cocoa, dry bread (preferably whole wheat), rice, raisins, prunes, dates, and fresh fruit, particularly apples and oranges, are to be recommended. The simpler the diet, on the whole, the more beneficial it is likely to be.

During the ascent never eat much at a sitting, but eat often and little at a time. Small rations of chocolate and raisins will be found particularly sustaining. These are rules well known to mountaineers. The more faithfully they are complied with, the higher will be your physical efficiency and the keener your enjoyment of the trip.

In order to facilitate the use of the following paragraphs as trail guides the various developed sections of the Park will be taken up in turn, starting with the most extensively used section, Paradise Valley.

Paradise Valley (Elevation Paradise Inn, 5,400 feet).

Alta Vista is a small eminence directly in front of Paradise Inn which affords splendid views of the surrounding country. The round trip is about one mile and can be made in an hour. The trail leads through splendid fields of wild flowers. On the southern slope of Alta Vista is held, on July 4th, an Annual Ski Tournament. Early in the season in Paradise Valley, winter sports may be held under summer conditions. Because of the tremendous snowfall the valley is not free of snow until late in July.

(Photograph by Ranapar Studio)

A Difficult Bit of Rock Work on the Front Face of Pinnacle Peak

The hotels and camps of Paradise Valley may be seen in the middle distance. The forests are almost 2,000 feet below the climbers

NISQUALLY GLACIER is one of the primary glaciers of the mountain; a rough river of ice flowing from the summit down through a deep canyon it has cut for itself, for a distance of 5 miles. The trail leads to the edge of the ice at a point about 2 miles above its terminus.

From Paradise Inn the Skyline Pony Trail is taken up the hill, past the log Ranger station and on, until near the rim of the canyon, a trail turns slightly to the left and drops over the rim. At this point one of the finest views of the mountain and glacier is had. The trail runs by easy grades to the lateral moraine of the Nisqually and follows up the moraine for a few hundred yards. Parties not accompanied by guide stop at this point. With guides and the equipment which they furnish it is possible to go almost to the center of the glacier and explore the crevasses, many of which are several hundred feet deep. (See description of the Nisqually Glacier, page 12.)

The trail to the edge of the ice affords a splendid half-day trip. The round trip of 3 miles may be made in 2 hours but more time will be desired. This is a foot trail only but is not difficult. The highest elevation reached is 5,600 feet.

PARADISE GLACIER. The Paradise Glacier trip is about 4 miles in total length and requires a full half day. Leaving Paradise Inn the Skyline Pony Trail is taken to the right, around the hill instead of up it. A half mile brings one to Edith Creek and Myrtle Falls. A few rods beyond the Paradise Trail turns to the left from the Skyline Trail and continues up the low divide to Timberline Ridge which is climbed by an easy series of switchbacks. From Timberline Ridge a wonderful view is obtained of the valley, the Tatoosh Range, Mount Adams, 48 miles distant, Mount St. Helens,

50 miles, and 120 miles away—seen between Adams and St. Helens—Mount Hood in Oregon, to the east the main range of the Cascades and to the north Rainier and Little Tahoma. The trail may be followed across the rocky ridges beyond timberline to the edge of the Paradise Glacier where a splendid view is possible but it is not safe to venture onto the snow-covered ice fields without guides. More people have been lost on the Paradise Glacier than on any other on the mountain. Returning to Timberline Ridge the same trail may be used in the return to Paradise Inn or the Skyline Trail may be followed in either direction although this involves from 1 to 2 miles greater distance and more climbing. The highest elevation gained on this trip is about 6,000 feet.

Reflection Lakes and Pinnacle Peak. Almost directly south of Paradise Inn is Pinnacle Peak, the most prominent of the Tatoosh peaks. The round trip, which involves some stiff climbing, requires the better part of a day. Between Mazama Ridge and Pinnacle Peak lies a series of lakes the largest of which, Reflection Lake, is skirted on the way to Pinnacle. A half mile toward the east on the Wonderland Trail is Lake Louise. From Paradise Inn, Pinnacle Peak climbers take the Valley Trail toward Narada Falls for a half mile, then turning to the left cross Paradise River and the automobile roads and climb Mazama Ridge at its lowest point. From Mazama Ridge the trail drops down into the meadows to Reflection Lake and joins the Lakes Trail which it follows for a few hundred yards to a footpath beyond the lake which leads directly toward Pinnacle Peak. Here the climbing over rock and snow begins. Climbers cross Pinnacle Glacier, pass through the saddle between Pinnacle on the right and Castle on the left, cross on narrow

ledges the back face of Pinnacle and climb through a rock "chimney" on the back side. The last 300 feet involves some very interesting rock work. Guides may be secured for this trip.

Pinnacle Peak to most climbers is the most satisfactory small peak to be climbed in the Park. The climb itself is ideal in its variety and setting and the view from the summit or even from the saddle is one of the finest in the country. Not only are gigantic Rainier and rugged Little Tahoma seen to their best advantage, but the Great Snow-Caps to the south are all in full view.

The elevation of Pinnacle Peak is 6,562 feet, and that of Reflection Lake is 4,861 feet above sea level. Reflection Lakes are reached also by a pony trail from Paradise Valley known as the Lakes Trail.

THE SKYLINE TRAIL is a loop trail, as usually taken about 4 miles in length. This is the most popular pony trail in the Park. It may also be made on foot requiring by either method a full half day. Starting from Paradise Inn the trail leads directly up the hill past the log Ranger station and around Alta Vista to the rim of the canyon at Glacier Vista, then up a series of switchbacks to Panorama Point, the highest elevation reached (6,800 feet), and on across the snow and ice along Timberline Ridge to Paradise River. Fording the river the trail turns down Mazama Ridge, passes alongside Sluiskin Falls and down across the valley again to Paradise Inn. For variety of country and view, for flower fields, glaciers, broad panoramas, waterfalls, and rushing streams this trip cannot be equalled. Parties on foot may turn back on the shorter Paradise Glacier Trail or may continue on around the Lake Trail which is really a part of the same trail, and may turn back from Reflection Lake

or continue to Narada Falls where there is the choice of two trails back to Paradise Inn. This entire trip would involve some 9 miles and requires the better part of a day to do it comfortably.

The Lakes Trail is another loop trail about 5 miles in length that makes a splendid half-day trip especially for those interested in wild flowers. Leaving Paradise Inn either the Valley or Switchback trails may be taken to Narada Falls, a 168-foot drop in the Paradise River. Here the trail crosses the automobile road and drops down into the forests directly below the falls, then climbs again over a wooded ridge into the meadows surrounding Reflection Lakes. Here it crosses the Pinnacle Peak trail and climbs to Faraway Rock and Artists Pool overlooking blue Lake Louise. From Faraway Rock the trail continues up Mazama Ridge and joins with the Skyline Trail below Sluiskin Falls. From here it is about a mile across the head of Paradise Valley to Paradise Inn.

Narada Falls, one and a half miles below Paradise Inn, is the objective of a good half-day trip either on foot or horseback. There are two trails known as the Valley Trail and the Switchback Trail. The Switchback Trail starts at the Public Auto Camp and follows alongside the road to the lower camp ground to a point opposite Paradise Lake. Here it turns down into the woods where a series of easy switchbacks carry one to the falls. The Valley Trail leaves Paradise Inn and crosses the road just before it turns into the valley. A half mile farther, the trail passes the Reflection Lake branch and follows down alongside the Washington Cascades, a mile of very rough water, to the final leap at Narada Falls. This trip, taken in either direction, makes a loop 3 miles in length. Narada Falls is 4,572 feet elevation.

Sluiskin Falls. Another interesting 3-hour walk may be taken to Sluiskin Falls at the head of Paradise Valley. This falls was named in 1870 by General Hazard Stevens for the Indian guide, Sluiskin. The Skyline Trail is taken to the bridge across the Paradise River, then the river is followed on the left side to the falls. In returning the river may be followed as far as the road along which a half mile of easy grade leads one to Paradise Inn. The elevation of Sluiskin Falls is 5,900 feet.

Glacier Vista, Panorama Point, McClure's Rock, Anvil Rock, and Camp Muir. A very popular trip that may be made from a few hours to a day in length is found by following the Skyline Trail to Glacier Vista for the splendid view of the mountain and the glacier, then up to Panorama Point where climbers may turn to the left from the Skyline Trail and in 0.5 of a mile over the rocks reach McClure's Rock (7,384 feet). Broad views are had from either Panorama Point or McClure's Rock. If desired the Summit route (there is no trail) may be followed over the snow and rock to Anvil Rock Fire Lookout Station, 9,584 feet above sea level. Here a Ranger is stationed all summer constantly on the lookout for fires. From his lofty position he can see for 100 miles or more over 250 degrees of angle—his view to the west being obstructed by the summit of Rainier. From Anvil Rock it is only 0.5 mile alongside the Cowlitz Glacier to Camp Muir, the half-way point on the summit climb. At Camp Muir, elevation 10,060 feet, are two stone shelter cabins built by the Government for the convenience and protection of mountain climbers. The trip to either Anvil Rock or Camp Muir requires a full day and involves some strenuous although not difficult climbing.

Before taking such a trip as the one described above it is advisable to consult the Ranger at Paradise Station and report to him again upon returning, except when accompanied by guides.

LONGMIRE SPRINGS (elevation 2,700 feet). Aside from the Longmire-Paradise Trail described on page 101 in connection with the Wonderland Trail, there is only one other trail to Paradise Park, known as the Glacier Trail. This is very little used and in places very steep. From Longmire Springs it follows the Nisqually River to the bridge at the terminus of the glacier, then crosses and climbs up the cliffs alongside the glacier by a steep narrow path to the lower edge of the Public Automobile Camp at Paradise Valley. From the Camp it is a half mile to Paradise Inn. This trail, 5.5 miles in length, requires about 3 hours up and 2 hours down.

VAN TRUMP PARK affords a splendid one-day trip from Longmire Springs. Van Trump Park is a high alpine meadow 5.5 miles from Longmire. There are two trails allowing a round trip of 11 miles of varied scenery. Leaving Longmire Springs at a point on the road just above the Government office the route follows the Indian Henry Trail to a point near the top of Rampart Ridge, then turning to the right follows up the ridge through the timber into the meadows of Van Trump Park, famous for their wild flower fields. The highest point reached on this trip is 5,500 feet elevation. Returning, the trail follows down Van Trump Creek past Bloucher Falls to Comet Falls with a 320-foot sheer drop, then on down the canyon to the road at Christine Falls. Crossing the road the trail soon joins the Glacier Trail and follows down the Nisqually River to Longmire.

The trip to Van Trump Park may be made in a half

day by taking a car to Christine Falls on the Nisqually road, and climbing from there 2.5 miles up past Comet Falls to the Park.

INDIAN HENRY'S HUNTING GROUND is usually reached by the Wonderland Trail described on page 106, but there are two other trails to this beautiful park. The original entrance was by what is now known as the West Side Trail which leaves the Nisqually road at Tahoma Creek, 1 mile within the Park entrance. This trail follows up the creek past the beaver colonies on Fish Creek to the junction with the Wonderland Trail at the 3.8 mile post. Here the trail turns to the right from the Lake George and West Side Trail and continues on up the creek to a crossing just below the Tahoma Glaciers from which it is about 2 miles on to the Ranger station at Indian Henry's. The distance from the Nisqually road by this trail is about 8 miles.

The other trail is an old one also and is little used as it is not particularly interesting. It leaves the Nisqually road at Kautz Creek and climbs through the woods past Tumtum and Satulick to the meadows of Mount Ararat which it crosses to the Ranger station at Indian Henry's. The distance from the road by this trail is about 6 miles.

RAMPART RIDGE TRAIL. This makes an interesting 4-mile trip of about 3 hours from Longmire Springs. The Indian Henry Trail is followed to the 2.2 mile post at the top of the ridge from which a footpath turns to the left to the highest point (4,000 feet elevation). From here a steep path leads down to the Inn at Longmire.

TRAIL OF THE SHADOWS. For a half hour's walk no finer trail can be taken than the Trail of the Shadows, which, keeping to the edge of the heavy forests, com-

pletely encircles the old beaver flat and mineral springs at Longmire. This trail, which starts directly opposite the Government office, leads past the Soda Spring and famous Iron Mike Springs, then on through the giant firs and cedars to the road again at a point just below the Inn. The entire circuit is less than a mile. This is a trail particularly interesting to those who love ferns and forest flowers.

Eagle Peak Trail. To the top of Eagle Peak, the most westerly of the Tatoosh Range, is 3.2 miles. While somewhat strenuous for the beginner it is recommended to those desiring a real hike with a splendid view. It is a full day trip and lunch should be taken. Leaving the road at a point just beyond the suspension bridge the trail climbs through forests for about 2.5 miles when it emerges into beautiful flower-filled parks through which it switches back and forth to the lowest point of the summit. To the left the main peak still stands above the saddle. Toward this peak a crude trail, somewhat dangerous, can be followed until the highest point (5,955 feet) is reached. An excellent view of Rainier and Paradise Valley, the other peaks of the Tatoosh and the great volcanoes to the south, with Longmire and the Nisqually Valley between, is obtained. The return trip is by the same route.

The Cowlitz River Trail leading from the public camp ground soon leaves the boundaries of the Park and proceeds past Bear Prairie and Skate Creek to Lewis and other Cowlitz Valley points 14 or more miles distant. Horse Creek, 2.5 miles from Longmire, affords good fishing at times and Bear Prairie, 3.5 miles from Longmire, makes a good half-day trip. From the suspension bridge also there are two short footpaths leading up the river for a short distance, one on

either side. These trails go no place in particular but are interesting to students of botany as they lead through dense fern- and vine-filled forests. From the river edge of the Public Automobile Camp, 0.5 mile by road from the Inn, is one of the finest views of the mountain to be had from Longmire.

The Mineral Springs at Longmire, some 48 in number, range from very cold to warm in temperature. The waters are highly carbonated and would be classed as very "hard." Aside from calcium carbonate and calcium chloride they contain small quantities of iron, sulphur, and other minerals which give them distinctive colors and tastes but have no special therapeutic value.

WHITE RIVER. Elevation White River entrance, 3,100 feet,
White River Camp, 3,500 feet,
White River Public Auto Camp, 4,400 feet.

THE YAKIMA PARK TRAIL begins at a point 3.0 miles above the entrance at the White River Camp. The trail climbs 3,000 feet in 3 miles up Sunrise Ridge to Yakima Park where a splendid view of the mountain, the northern glaciers, and White River Valley is had. This is a large park with fine flower fields, numerous small lakes, and fine views. The trail leads on and divides, the trail to the right leading to Huckleberry Creek and Park, and a second trail, a mile farther on, leading to Grand Park, and on past Lake James to Chenuis Mountain and down to the Carbon River Ranger Station on the Carbon River road. To the left the trail follows down Burroughs Mountain and divides again, the trail to the left leading to Glacier Basin and the one to the right down to the Winthrop Glacier and on past Mystic Lake, through Mo-

raine Park to Carbon Glacier and Carbon River Ranger Station and road. The distance to Yakima Park is about 6 miles. This makes a fine one-day trip either returning to White River or going on to Glacier Basin.

The Klickitat Trail leaves the road 3.0 miles above the entrance, leading to the left from a point 200 feet above and opposite the Yakima Park trail. The trail crosses White River and follows up Klickitat Creek for 5.5 miles to the summit of the Cascades at Chinook Pass and joins the Yakima auto road near Tipsoo Lake. This is a very scenic trail with fine views of the mountain and of the lakes and peaks of the Cascades. It crosses the eastern boundary of the Park, about a mile beyond White River, and the remainder of the trail is within the Rainier National Forest. To the summit of the range at Cayuse Pass or on to Chinook Pass, a mile farther, near Tipsoo Lake, and return makes a splendid one day trip.

The East Side Trail to Ohanapecosh Hot Springs turns to the left from the road at a point 5.5 miles above the entrance, crosses White River by a pony bridge, and proceeds to Ohanapecosh Ranger Station and Hot Springs, 18.0 miles from the road. About 1 mile from the bridge the trail turns to the left from the Summerland Trail, crosses Fryingpan Creek, and climbs up between Tamanos Mountain and Governor's Ridge to Owyhigh Lakes, a series of beautiful little lakes situated in a high alpine meadow at the base of the Cowlitz Chimneys. Several fine views of the mountain are had from this park. Owyhigh Lakes are 5.5 miles from the road. The trail drops down into the woods again and follows Kotsuck Creek to its junction with Chinook Creek at a point about 1.0 mile outside the park boundary. It then follows Chinook Creek back into the Park and to its junction

with Ohanapecosh River, then down the Ohanapecosh crossing Cougar Creek, past Silver Fall and Laughing-water Creek to the Ohanapecosh Ranger Station on the Park's southern boundary. Ohanapecosh Hot Springs are 0.2 mile below the station. Springs of boiling hot water and a camp-hotel are found here. The trail leads down to the town of Lewis, 13.0 miles below. It is a hard day's trip from White River to Ohanapecosh Hot Springs and most people will find it more desirable to take two days for it, camping one night on the way.

SUMMERLAND, considered by many as one of the most beautiful high alpine parks on the mountain, is 6.0 miles from the road. The trail leaves at a point 5.5 miles above the entrance, crosses White River and is the same as the East Side Trail for about 1.0 mile. Where the East Side Trail turns to the left, the Summerland Trail keeps on up Fryingpan Creek. Summerland is located on two high shoulders of the mountain at an elevation of about 5,500 feet. There is an unusual view of the mountain, fine streams, a small lake, and wonderful wild flower fields. Fine camp sites are found here. This section of the Wonderland Trail provides a very popular one-day round trip from White River.

EMMONS GLACIER can be reached by a trail leading up the valley 1.0 mile from the end of the White River road. The Emmons is the source of White River and is the largest glacier on the mountain. It is about 6 miles long and 2 miles wide at the widest point. It starts from the summit of the mountain and moves from 1 to 2 feet a day in the summer. The lower reaches are covered with talus carried down from the cliffs above by the ice, but underneath this layer of rock the ice is clean and pure. One should not ven-

ture on to the glacier without guides because of hidden crevasses.

Glacier Basin and Starbo Camp can be reached by following the old mining camp road, 2.5 miles above the end of the auto road. There is a deserted mining camp here, fine views, beautiful flower-filled meadows, and fine camp sites with grass and good water. The trail leads on from here up Burroughs Mountain and down to the Winthrop Glacier and on to Mystic Lake and Carbon River. Two miles from Glacier Basin a trail branches to the right leading through Yakima Park 3.5 miles and on down to the auto road near White River Camp. There is another trail leading up Glacier Basin and over St. Elmo Pass, then down the Winthrop Glacier to the Burroughs Mountain-Mystic Lake Trail at the terminus of the Winthrop, but it is not in good shape and is impassable for horses. Glacier Basin may be reached in about an hour from the end of the White River road.

Carbon River (elevation at entrance 1,716 feet). In the Carbon River district is found some of the finest scenery of the Park. As yet it is not extensively developed but affords the campers who love the wilderness many wonderful trips.

Mowich Lake, the largest and deepest lake in the Park, is reached more readily by the Ipsut Pass Trail than by any other. This is a part of the West Side Trail and leaves the Carbon road at Ipsut Creek, 5 miles from the entrance. By a series of ever shortening switchbacks the trail is carried out of the forests to a narrow notch in the Mother Mountains known as Ipsut Pass (elevation 5,100 feet). It is through this Pass that the West Side road is to reach Mowich Lake, 2 miles farther on. The distance from the road to Mowich Lake is about 6 miles and will require 4 hours

climbing. Mowich Lake, at an elevation of 4,929 feet, affords splendid camp sites and many side trips. Among them Knapsack Pass, Eunice Lake, Spray Park, and Mountain Meadows are the most popular. The return trip from Mowich Lake may be made along the Wonderland Trail described on page 104. This goes by way of Spray Falls, Spray Park, Mist Park, and Cataract Creek. The distance to the road is about 10 miles.

The CARBON GLACIER is reached in less than a mile from the end of the Carbon road. The trail crosses Cataract Creek, turns to the left and crosses the Carbon River 0.5 below the Glacier; from here the route is along the left side of the river to the moraine alongside the ice.

MORAINE PARK AND MYSTIC LAKE make a wonderful although strenuous one-day trip from the Carbon. The trail, which is a section of the Wonderland Trail, is described on page 104. From the terminus of the glacier to Mystic Lake is 5.5 miles involving a climb of 2,500 feet. The elevation at Mystic Lake is 5,800 feet.

CHENUIS MOUNTAIN AND NATURAL BRIDGE. Another remarkable though somewhat long one-day trip may be made from the Carbon River road up Spukwush Creek to Chenuis Mountain (elevation 5,340 feet) where wonderful views are obtained of the north side, the Cascades, with Glacier Peak and Mount Baker, the Selkirks in Canada and the Olympics beyond Puget Sound. The trail leads on to Windy Gap alongside the rugged Sluiskin peaks and on to Lake James, Grand Park, and White River points. From Windy Gap a trail leads to the left one mile to the Natural Bridge, a 200-foot arch of rock barely 10 feet in width spanning a gorge at the foot of which in their

setting of green, lie beautiful Lake Ethel and Lake James. The Natural Bridge, because of the ruggedness of the surrounding country, is not visited by many people but it alone is worth the 16-mile round trip from Carbon River.

NORTHERN LOOP TRAIL. A trip of from 4 days to a week that will become increasingly popular as the north side of the Park becomes better known, may be had through very rugged country over the Northern Loop Trail. This trail leads from the Carbon River over Chenuis Mountain, past Lake James to Grand Park, and on past Frozen Lake to Yakima Park, thence down Burroughs Mountain to the Wonderland Trail which leads back past the Winthrop Glacier and Mystic Lake. The same trip may be made from the White River side starting either from Yakima Park or Glacier Basin.

OHANAPECOSH DISTRICT (elevation at Ranger station 2,004 feet). The Ohanapecosh Hot Springs are reached by a road from the village of Lewis, 13 miles below the Park in the valley of the Cowlitz River. The entrance to the Park is only 0.2 of a mile above the Hot Springs. From here some wonderful scenic country is accessible by well-built pony trails. The two trails which meet just above the Ranger station are both described in previous paragraphs either under the East Side Trail or the Wonderland Trail. Points of particular interest are: Box Canyon of the Muddy Fork, 8 miles; Indian Bar, 10 miles; Silver Falls, 1.5 miles, and Ohanapecosh Hot Springs, 0.2 mile, but outside the boundaries of the Park.

BOOK III

FLORA AND FAUNA

CHAPTER VI

Life Zones on Mount Rainier

As one goes from sea level on Puget Sound toward the summit of the mountain by any of the approach roads he cannot help but notice the marked changes that take place in the character of the vegetation. This is noticed not only in the manner of growth, the type of forests and other ground cover, but also in the distribution of species. It is observed also that the birds of the lower valleys are not the same as those of the higher altitudes and a closer study would reveal the fact that practically all manner of life is influenced more or less by marked changes of elevation.

It is not to be implied that elevation in itself has this striking effect upon plant and animal life. The result is brought about indirectly. Altitude above sea level, other things being equal, controls temperature and it is the result of these various layers or zones of different climatic conditions that plant and animal life differ decidedly at different levels on the mountain.

To lend convenience to the study of these existing conditions so-called Life Zones have been worked out which may within a given locality, such as Mount Rainier National Park, be roughly correlated with altitude, although as has been stated they depend largely upon temperature and to a less degree upon humidity.

However, in the case of Mount Rainier, which stands entirely within the moist Pacific slope belt, the effect of humidity in determining life zones is less marked than it would be in a larger region over which the amount of rainfall varies considerably.

From sea level to the summit of the peak four distinct life zones are found, namely, the Transition, Canadian, Hudsonian, and Arctic-Alpine. This statement applies equally to the National Park, as the first or Transition Zone extends to well within its boundaries.

Making due allowance for the inevitable overlapping of the various zones, the following approximation of their altitudinal limits on the mountain may be made:

Transition	0 to 3,500 feet
Canadian	3,000 to 5,000 feet
Hudsonian	4,500 to 7,000 feet
Arctic-Alpine	6,500 to 10,500 feet

Above about 10,000 feet no plant or animal life may be said to be indigenous although a few species of both birds and mammals are occasionally found frequenting the great ice dome and several species of plants, principally lichens, are found growing in favorable situations as high as the crater itself.

As may be inferred from the names applied to them, these zones comprise those with thermal conditions comparable in a general way with the climatic zones encountered as one moves toward the pole, as for example, the Hudsonian Zone corresponds in conditions, and in a large part in species, to that found in the latitude of Hudson Bay, and the Arctic-Alpine with the treeless region beyond the Arctic Circle.

These zones are not separated by level altitudinal

lines. This may readily be seen where the Hudsonian and Arctic-Alpine zones meet, a line marked by the limit of tree growth. The trees of the former zone extend up the mountainside much higher on the ridges than in the valleys between. The dividing line is thus a sinuate one. One might at first suppose that this is due entirely to the fact that the valleys are filled with glaciers and undoubtedly this has considerable to do with it, as at one time the entire peak was covered with snow and ice and without doubt the ridges were exposed first and have therefore had more time to build soil and otherwise offset the effects of glaciation, but it is also due to a more favorable exposure to the sun's rays and to the well-known fact that cold air currents flow down the valleys while the warmer air follows up the ridges.

Transition Zone

Within the Park the Transition Zone extends to the vicinity of Longmire Springs, White River Camp, and Ipsut Creek on the Carbon River road. Typical locations may be found about any of the Park entrances. It comprises the belt of heavy lower slope forests composed largely of Douglas Fir, Western Hemlock, and Western Red Cedar. Other typical trees are the Red Alder, Oregon Maple, Black Cottonwood, Amabalis Fir, and Western Yew. The rank growths of ferns, Vine Maple, Devil's Club, Skunk Cabbage and the abundance of Canada Dogwood, Twinflower, Trillium, and ferns are marks of this zone. Well-known Transition vertebrates are the Band-tailed Pigeon, Northern Spotted Owl, Western Winter Wren, American Beaver, Mountain Beaver, Douglas Squirrel, and Cooper Chipmunk.

Canadian Zone

The Canadian Zone extends to the edge of the Alpine meadows at approximately 5,000 feet elevation, or in the vicinity of Narada Falls on the Nisqually road, Mowich Lake on the northwest side, and the end of the automobile road in White River valley. Type localities may be found at about the terminus of any of the glaciers. Throughout this zone the trees, although still occurring in dense stands, are appreciably smaller and the undergrowth is not so rank. The Amabalis Fir is replaced by the Noble Fir. Western Hemlock is still common but the trees are smaller. Alaska Yellow Cedar and Spruce (on the north side) are abundant and the Western White Pine is perhaps the typical tree. A species of air plant, the Goat's-Beard Moss, grows in festoons on the trees. Red and Blue Huckleberries, White Rhododendron, Kinnikinnick, Pearly Everlasting, and Yellow Mimulus are common and the characteristic fauna include the Hoary Marmot, Mantled Ground Squirrel, Gray Jay, and Water Ouzel.

The Canadian Zone within the Park is the most illy defined of all the life zones, merging into the Transition below and the Hudsonian above. It is an intermediate zone in which few species may be said to be confined. Nearly all the common plants, and animals as well, although more abundant in this zone also occur in either the Hudsonian or Transition Zone and in the case of several, such as the Gray Jay, Alaska Cedar, and the White Rhododendron, occur in both.

Hudsonian Zone

The Hudsonian Zone includes that belt of parklike alpine meadows lying between the upper edge of the

Life Zones on Mount Rainier

dense forests and timberline or approximately between elevations of 5,000 and 6,500 feet. It is very definitely marked as the zone of Alpine Firs and Mountain or Black Hemlock. The Alaska Cedar under favorable conditions extends into the zone and the White-barked Pine, a typical timberline tree which holds the altitude record on the mountain, is found sparsely in the upper edges of the Hudsonian Zone. This is the zone of the wonderful sub-alpine flower-fields and characteristic species are difficult to select because of their numbers rather than their scarcity. Some 300 species or three-fifths the number listed in the Park occur in this zone, many of them being largely confined to it. A few that might be mentioned are the Red Heather, the White Heather, the Dwarfed Blue Huckleberries, the Erythronium or Avalanche Lily, Squaw Grass, Valerian, Suksdorf's Buttercup, Indian Paintbrush, Western Anemone, Arctic Lupine, and Mountain Asters.

The typical bird is the Clarke Nutcracker. The Sooty Grouse, Pine Siskin, Rufous Hummingbird, and Mountain Bluebird could also be included.

Of the animals the Cony or Rock Rabbit is pre-eminently the Hudsonian type. Other characteristic mammals are the Little Chipmunk, Mantled Ground Squirrel, Pine Marten, Weasel, Pack Rat, Jumping Mouse, and Large-footed Meadow Mouse.

Arctic-Alpine Zone

As one goes from timberline toward the great snow dome, which still towers 7,000 feet above, fewer and fewer species, and likewise individuals, of both plant and animal life are encountered until at the elevation of Camp Muir (10,000 feet) the limit of life is reached except for a few hardy lichens growing in favorable

shelter and an occasional Chipmunk, Ground Squirrel, or Rosy Finch which has wandered beyond its normal range.

This is the Arctic-Alpine Zone which corresponds very closely in both climatic conditions and types of plant and animal life with that great treeless waste beyond the Arctic Circle. Here a few trailing Junipers and Arctic Willows are the only representatives of the forests below, and these grow only where sheltered from the winds. The list of herbaceous plants is considerably more varied although as compared with the Hudsonian Zone very limited in extent. Dominant among these are the Lyall's Lupine, the Mountain Phlox, the Tolmie Saxafrage the Lutkea, a yellow mustard, and several grasses.

Although the animal life of the Arctic-Alpine Zone is decidedly limited in variety its species are characteristic of the high wind-swept ridges and pumice fields and are among the most interesting of those that inhabit the Park. This is the normal range of the White Mountain Goat, the White-tailed Ptarmigan, the Leucosticte or Rosy Finch, the Pipit, and the Pine Siskin. Other animals and birds that range through this zone are the Cascade Fox, Coyote, Marten, Marmot, Mantled Ground Squirrel, Little Chipmunk, Juncos, Sandpipers, Hawks, and Eagles.

Throughout all life zones of the National Park from the boundaries to the summit, 15 varieties of coniferous trees occur, 5 varieties of broad leaf or deciduous trees, 34 ferns and allied plants, and 483 other flowering plants including the grasses.

105 varieties of birds have been listed and 54 mammals may be found indigenous to the Park.

CHAPTER VII

Flowers of the National Park [1]

It is likely that the National Park is more famous—taken the world over—for its remarkable fields of wild flowers than for any other one feature. The expression "where flowers and glaciers meet" is literally true, and such marvelous God-made flower gardens have been found nowhere else on earth.

Down in the belt of dense lower-slope forests comparatively few flowers bloom, but those that do find in the damp mossy woods a habitat suitable for their needs are often very beautiful and in numerous instances quite unusual. These shade-loving species—orchids, ghost pipes, pyrolas, wintergreens, skunk cabbages, anemones, and dwarf dogwood—combine with the ferns and mosses to give a fresh verdant appearance to the moist forest floor.

It is in the open alpine meadows above this belt of heavy timber and just below the line of permanent snow that the famous wild flower fields are found. Between the scattered clumps of sub-alpine trees the fields are so carpeted with lovely blossoms throughout the summer that the ground is entirely covered over large areas. As this series of mountain parks extend,

[1] The author is indebted to Mr. J. B. Flett and Mr. Charles V. Piper for valuable assistance in the flora of the Park. Mr. Piper's book, "Flora of Washington," published for the Smithsonian Institution, has been used freely as a key.

between elevations of 5,000 feet and 7,000 feet, entirely around the ancient peak, the result is a perfect garland of wild flowers two miles in width and fifty miles in circuit draped like gigantic "leis" of fragrant blossoms about the shoulders of the snow-crowned Monarch.

Of flowering plants some five hundred species and varieties have been recorded, and that this list is far from being complete, no one doubts.

Although Dr. William E. Tolmie started the botanical work on Mount Rainier as early as 1833 and such men as Charles V. Piper, E. C. Smith, E. L. Green, J. B. Flett, M. W. Gorman, and O. D. Allen have made more or less extensive studies since, nothing that adequately covers the very abundant and extremely varied flora of the region has ever been published. The lower orders of plants, such as the fungi, liverworts, and mosses, remain largely a sealed book waiting for someone to open it.

Because of limited knowledge and because the object of this work is to put information at the hand of the average observer rather than the student of botany, the writer will attempt to deal only with the more common species of flowers that are encountered every day by thousands of people. Of the five hundred species that are known to occur, only about one hundred will be found in abundance, and it is these that are described briefly.

Botany is a highly specialized study that only a few have the time or inclination to take up seriously—but interest in growing plants and the love of flowers is well-nigh universal, and it is for the great group thus concerned that the following chapter is written.

No attempt has been made to classify the flowers or to list them in their botanical order but rather a system of grouping has been employed that, although it may

not be botanical, will in most cases aid in the identification of the flower.

Plants have very decided likes and dislikes as to the environment in which they prefer to grow and it so happens that the majority of the species described have distinctive colors, so the following common flowers of Mount Rainier National Park have been grouped first under the heading of color, and this subdivided into types of habitat. Where flowers grow in two or more types of localities they are listed under each, but referred back to the more common habitat. The same method has been employed as regards colors.

As an example in the use of this crude key: suppose that a flower of some shade of red is found growing in or near water or in marshy ground. A glance under these two headings would instantly determine it to be one of four plants and since each of these vary greatly in form the brief descriptions given will be sufficient to identify it—providing, of course, it is one of the common flowers listed.

DESCRIPTION OF SPECIES

WHITE FLOWERS OF THE OPEN SPACES AND MOUNTAIN MEADOWS

Avalanche Lily, Dog-Tooth Violet, Deer's Tongue

Erythronium montanum Lily family

Because it grows in such masses that hillsides covered with these white lilies resemble new fallen snow, the *Erythronium montanum* has come to be known locally as the Avalanche Lily. No flower blooms in greater

abundance in the high alpine meadows and none is more beautiful. The flower stalks grow from two smooth, waxy leaves to a height of from a few inches to a foot or more, and bear, usually, one, but often three to four and sometimes as many as twelve, pure white star-shaped flowers with gold centers that are from two to four inches in diameter. As soon as bare patches appear on warm hillsides late in June in the open parks the Avalanche Lilies bloom; some of them in fact do not wait until the snow has gone but push their way through two or three inches of snow and are occasionally found blooming thus through belated snowdrifts. Back a few feet from the snow, acres of area are covered so profusely that it is impossible to walk without trampling down hundreds of them. From late June to middle July the white and yellow Avalanche Lilies predominate and in cool shady places where the snow lies late they may be found as late as mid-August. Other flowers that come early with the Avalanche Lilies are the Indian Paintbrush, Western Anemone, and Potentilla.

Western Anemone, Challis Cup, Wind Flower

Pulsatilla occidentalis Buttercup family

The Western Anemone is a typical flower of the high meadows where it blooms early in the season. Soon after the snow disappears the white, rounded petals of the Anemone open into a slightly cupped flower from one to two inches in diameter which blooms close to the ground before the soft, finely divided leaves unfurl. The flower stays only a few days, then wilts and dies down, following which the leaves rapidly develop into a rounded feathery tuft and the central stalk grows to be about a foot in length and develops the fluffy silver-

(Photograph by Asahel Curtis)

Avalanche Lilies (*Erythronium montanum*) growing through belated Snow Drifts

(Photograph by Ranapar Studio)

Avalanche Lilies (*Erythronium montanum*)

Both the white and the yellow varieties of this lily are very abundant in the meadows even before all the snow has melted

gray seed pod which is so abundant and so conspicuous in the alpine meadows all through the season. The flowers are found until late in July, but the seed pod, which is quite as interesting if not quite as beautiful, is present until snow comes in the fall.

Valerian, Mountain Heliotrope

Valeriana sitchensis Valerian family

The dense rounded heads of the Valerian, composed of hundreds of tiny white flowers and standing on slender stalks often three feet in height, are common all through the meadows and particularly along the roads and trails of the open country. The leaves are compound, usually with three oval leaflets. The fresh flowers have a sweet odor that resembles that of the garden heliotrope. Later in the fall, particularly after frosts, the decaying plants have a foul odor which more nearly resembles the Valerian of medicine made from this plant and used extensively as a nerve sedative. Occasionally there is a pink tinge to the center and undersides of the tiny flowers but in most specimens this is not noticeable.

The Valerian blooms early in July and is abundant until late in August.

Mountain Dock, Smartweed

Polygonum bistortoides Buckwheat family

The Mountain Dock with its catkin-like tufts of white flowers at the top of slender grasslike stems, and its long narrow smartweed leaves, is a common flower throughout the summer in the alpine meadows above 5,000 feet elevation. The flower clusters, usually about an inch in length, are borne on stalks

from one to two feet in height which bear slender leaves from the nodules and a whorl of larger leaves at the base. There are several species of *Polygonum* found in the Park but *bistortoides* is by far the most common. It blooms at its height late in July and early in August in normal years.

White Heather, Bride's Heather, White Heath

Cassiope mertensiana Heath family

Among the most popular flowers of the Park are the heathers, four species of which occur. The White Heather, known as bride's heather in Scotland, although not as abundant as the red heather, is in the opinion of many people the most beautiful of all the family. The pure-white, lily-of-the-valley-like bells, pendant before a very dark green background of foliage, are among the most exquisite of flowers. The bells grow in such profusion as to almost cover the clump, are about one-fourth inch in diameter, open, and occur singly rather than in groups as does the red heather. The leaves are rich green, scalelike, and form four-sided twigs.

White Heather occurs all through the open meadows between 5,000 feet elevation and timberline, in small scattered clumps, mixed here and there with the more abundant red heather. The height of the heather season is from early in July to mid-August.

Squaw Grass, Indian Basket Grass, Bear Grass

Xerophyllum tenax Bunch-flower family

No flower comes earlier or remains later, and few grow in such a variety of environment as does the Squaw Grass which in various parts of its broad range

White Heather

A Field of Indian Basket Grass

Blue Gentians

Pentstemons

Flowers Typical of the High Alpine Meadows

is known by no less than eight or ten different common names. Squaw Grass or Indian Basket Grass are both appropriate as the local Indians use the grass-like leaves in making some very wonderful baskets—baskets that will stand generations of hard usage and hold water. It is known as Bear Grass because bears frequently dig out the succulent root stalk for food.

The club-shaped spike of flowers is borne on a heavy woody stalk covered with modified leaves which give it a scaly appearance. The individual flowers are pure white or creamy white, star shaped, and from a quarter to a half inch in width arranged in a compact head. The flower stalk is usually between two and three feet in height and grows from a heavy bunch of sharp grasslike leaves. Within the Park the Squaw Grass grows from the boundaries to well above timberline, preferring burns and open meadows, but it often grows though seldom blooms in open woods. It reaches its finest growth in burns and meadows between 4,000 and 6,000 feet elevation. The height of the blooming season is in July although it blooms in June at lower levels and as late as September about timberline.

Pearly Everlasting, Straw Flower

Anaphalis margaritacea occidentalis Aster family

The Pearly Everlasting, with its slender stalks, bearing leaves with silvery undersides, and bunches of small white flowers at the top, is very abundant up to 5,000 feet elevation, preferring roadsides and burned-over areas. It is one of the most abundant flowers of the Silver Forest, competing with the Fireweed for first place. The petals are dry and the heads of flowers rattle like dry straw when shaken. The stalk usually stands about one foot in height. These flowers are

sometimes used as winter decorations as they will keep indefinitely after being picked if not placed in water.

Indian Tobacco, Lady Tobacco, Cudweed

Antennaria media Aster family

The Cudweeds are easily known by the white woolly appearance of the short leaves. These plants are related to the Swiss Edelweiss but do not have the star-shaped flower of the Edelweiss. The flower of *media* very much resembles the pads of a cat's paw and are sometimes called pussy-foot for that reason. The leaves, though only an inch or two in length, grow in such abundance in the upper meadows at about 5,800 feet elevation that they appear as white patches on the ground.

Cudweed, Cat's-Paw Cudweed

Antennaria lanata Aster family

Another Cudweed equally abundant on the grassy slopes between 5,500 and 6,000 feet elevation is this Cat's-Paw Cudweed. It is somewhat larger and more hairy than *media* but otherwise greatly resembles it.

Lutkea, Alaska Spiræa

Lutkea pectinata Rose family

The matts of green or bronze, twice or thrice palmately three-cleft leaves of the Lutkea are almost as abundant in the high meadows as are the matts of heather. Late in July and throughout August this interesting little plant may be found bearing short racemes of tiny creamy-white flowers. The leaves are usually about

two inches in length and the flower stalk seldom over four inches in height. Although in general appearance there is little resemblance, this tiny plant is closely related to the spiræas.

Mountain Ash

Pyrus sitchensis (*Sorbus sitchensis*) Apple family

The Mountain Ash although it becomes a fair-sized tree at sea level and is used extensively in the Coast cities as a shade and street tree, seldom grows more than four to six feet high in the Park, where it occurs most abundantly on the edge of the woods or at the base of clumps of trees in the parklike meadows. It is very popular with birds and animals, as well as people, because of the large, flared, bunches of beautiful red berries which it bears in the fall. The flowers are tiny, in flat bunches, and bloom early in the summer. The compound leaves resemble those of the locust to some extent, being pinnate with small oval leaflets about one inch in length.

Wild Parsnip, Wild Parsley

Ligusticum purpureum Parsley family

This Wild Parsnip is everywhere abundant in the open meadows up to timberline. The flower stalk is tall—from two to three feet in height—has finely divided fernlike leaves and loose bunches of small white flowers that sometimes have a purplish tinge. Late July marks the height of the blooming season which extends over several weeks. The small angular seeds are a favorite food of the pine siskins and finches in the late summer.

Giant Hellebore, False Hellebore

Veratrum viride Bunch-flower family

A tall herbaceous plant with heavy parallel-veined leaves and a tall stem bearing drooping panicles of greenish-white flowers late in the summer. (See Green flowers, page 190.)

Suksdorf Silene

Silene suksdorfii Pink family

A Pink-like flower with notched petals, narrow opposite leaves, and a striped toy-balloon-like calyx, which grows on warm grassy slopes in the alpine meadows. (See Red-Pink, page 159.)

Elderberries

Sambucus callicarpa Honeysuckle family

This is the red Elderberry common all through the lower valleys and as far down as sea level. Occurring occasionally near the boundaries of the Park is the Blue Elderberry (*Sambucus melanocarpa*). The Red Elderberry has the characteristic pithy stem, compound leaves, and small white flowers common to all Elderberries but the fruit which ripens late in the summer grows in small spikelike bunches and consists of smooth red berries about one-eighth inch in diameter.

Saxifrage

Saxifraga bronchialis Saxifrage family

A small white flower a half inch across with five petals. Flowers grow singly on short stems with sharp lancelike leaves. This is one of several Saxifrages

Avalanche Lily

Western Anemone

Purple Aster

Giant Hellebore

common in the high valleys. *Bronchialis* may be found in bloom during July and August in drier places than those usually selected by members of this large family. It sometimes occurs as low down as Longmire Springs where it grows on rock cliffs.

Willow Herb, Epilobium

Epilobium alpinum Evening Primrose family

Epilobium alpinum is a tiny white relative of the common fireweed with short herbaceous stems, toothed leaves, and long smooth seed pods. It is abundant in rich soil and favorable situations in the mountain meadows about 5,500 feet elevation. A close relative, even smaller and red in color, is found in the wet moss of the sub-alpine streams.

Kinnikinnick

Arctostaphylos uva-ursi Heath family

Everyone is familiar with the small oval, laurel-like leaves and bright red berries of the Kinnikinnick which covers rocks and roadsides up to 8,000 feet elevation. The flower is small and inconspicuous and blooms early in the summer. The plant is a low trailing shrub and is evergreen.

Western Yarrow

Achillea lanulosa Aster family

This alpine form of the common Yarrow is abundant in decayed lava and volcanic soil up to timberline. The characteristic odor, soft finely divided leaves, and flat topped bunches of tiny white flowers with yellow

centers are well known to everyone. Yarrow may be found blooming until snow flies in the fall.

WHITE FLOWERS OF THE FORESTS

White Rhododendron

Rhododendron albiflorum Heath family

Quite unlike the common Rhododendron with its heavy evergreen leaves and pink flowers is this white Rhododendron of the upper fringe of the forests. The plant is a woody shrub often four feet in height with thin waxy deciduous leaves and white flowers about an inch across growing singly or in small clusters along the twig rather than in bunches at the tip as with the common Rhododendron.

The plant prefers the more open woods of the Hudsonian zone and the margins of the meadows. Usually the height of the blooming season is in the latter part of July and early in August when the orange-blossom-like flowers do their share toward making the upper roads a place where one wants to linger rather than hurry by in speeding cars.

Salal

Gaultheria ovatifolia Heath family

No plant is more common in the more open forests of the Canadian zone than the ovate-leaved Salal where it associates with the red huckleberry and the Oregon grape to furnish much of the ground cover. The leaves are from two to three inches long and almost as broad as they are long. They are evergreen and contain volatile oils which cause them to burn readily. The plant lies close to the ground, bears white or pinkish

Elephant's Trunk Lousewort

Duck's Bill Lousewort

Indian Pipes

Canada Dogwood

globe-shaped flowers in July, and ripens the thin clusters of dark, edible berries late in the summer. While occurring in greatest abundance at about 3,000 feet elevation, the Salal is a common plant throughout the forested regions of the Park.

Canada Dogwood, Bunchberry

Cornus canadensis Dogwood family

The tiny Dogwood so abundant everywhere in the lower forests bears little resemblance in size to its cousin the Flowering Dogwood which becomes a fair-sized tree, although the leaves and flowers are very similar. This little plant lines the roads below 3,000 feet and as it blooms, from early spring to late fall, receives its share of attention and praise from the visitors to the Park. The plant stands from three to eight inches in height with a single flower at the end of the stalk in the center of a whorl which usually consists of six leaves. Actually there are many tiny flowers in a compact bunch which forms the center of the so-called flower, the petals of which, four in number, are in reality only modified bracts. Late in the summer it bears small bunches of bright red berries, quite as beautiful as the flower, which gives rise to the name Bunchberry. In the fall after the berries mature it is not uncommon to find the Canada Dogwood in bloom a second time, a habit which it also shares with the Flowering Dogwood.

Indian Pipe, Ghost Pipe

Monotropa uniflora Indian Pipe family

In the moist lower forests there are several strange little plants of this family that live on decayed wood

and other vegetable matter. Occasionally they are mistaken for fungus growths because they have lost their green coloring-matter like plants that have grown in the dark. None are more beautiful or abundant than this single-flowered Indian Pipe, so called because of its resemblance to a tiny white clay pipe. There is another common species popularly called the Many-flowered Indian Pipe which has several flowers on the same stem. The normal color of the entire plant is pearly white although it is sometimes pink when young and becomes darker with age. The plants grow from three to ten inches in height and are most abundant in July and August.

Alpine Beauty

Clintonia uniflora Lily-of-the-Valley family

Associated everywhere with the Dogwood and Forest Anemone in the lower forests is this dainty Alpine Beauty with its single star-like white flower on a short stem growing from three smooth waxy leaves. The flowers are entirely white and the leaves are a uniform transparent green. The fruit is an elongated blue berry. July and early August marks the height of the blooming season although at the upper limit of its range at about 5,000 feet it may be found blooming late in August.

Trillium, Wake-Robin

Trillium ovatum Lily-of-the-Valley family

Another of the Lily-of-the-Valley family that is everywhere abundant, from the Sound to 3,000 feet elevation in the Park, is this three-leaved, three-petaled

Trillium. The plant stands about a foot in height, has oval leaves always arranged three in a whorl and a white flower at the tip which is white at first but becomes streaked with purplish as the flower grows older. Within the Park it is found in June and early July in moist rich soil at the edge of the woods.

Forest Anemone, Wood Anemone

Anemone deltoidea Buttercup family

Everywhere in the woods in June and July there is an abundance of the beautiful wild-rose-like Forest Anemone associated with the Alpine beauty and the Canada dogwood. The flowers stand from six inches to a foot from the ground, on slender dark stems, bearing one whorl of three oval, notched, leaves. These wonderful little flowers, which are from one to two inches across, are often found in dense patches because of their spreading roots but the plants always grow singly. The plant differs in practically every respect from its relative of the high meadows, the Western Anemone. The Forest Anemone blooms from June to August in the moist woods below 4,000 feet.

Bird's-Foot Bramble

Rubus pedatus Rose family

Along woodsy trails and in small openings in the forests from the alpine meadows down, are found matts of the Bird's-Foot Bramble, one of three or four species of *Rubus* found in the Park. It is easily recognized by its small white strawberry-like blossoms, trailing habits, and compound leaves.

Vanilla Leaf, Smelling Leaf, Sweet-after-Death

Achlys triphylla Barberry family

The Vanilla Leaf bears a single rounded leaf composed of three distinct lobes or leaflets and a small feathery spike of tiny white flowers on a slender green stalk about a foot in length. It is a common plant of the low moist river valleys where it grows in the heavy forests with the dainty oak ferns and the wild bleeding-heart. The leaves have a pleasant odor which increases as they dry. This accounts for the various common names.

Mountain Ash

Pyrus occidentalis Apple family

A shrub with compound leaves, bunches of small white flowers, and red berries more often found in the open areas. (See page 143.)

WHITE FLOWERS FOUND AMONG ROCKS

Tolmie Saxifrage

Saxifraga tolmiei Saxifrage family

A tiny white flower with small, thick, rounded, leaves more often found growing in rocks and on pumice slopes above timberline. (See page 151.)

Saxifrage

Saxifraga bronchialis Saxifrage family

A small white flower similar to *tolmiei* but with longer sharp-pointed leaves. (See page 144.)

SAXIFRAGE

Saxifraga cespitosa Saxifrage family

The flowers of the Saxifrage may be known by the fact that they have ten stamens. Nearly all of the several species that occur in the Park are sub-alpine in range and short stemmed, with small white flowers. *Cespitosa* may be known by the divided leaves like a hand with spread fingers and the fact that it prefers to grow on moist cliffs.

WHITE FLOWERS FOUND ABOVE TIMBERLINE

TOLMIE SAXIFRAGE

Saxifraga tolmiei Saxifrage family

Many people stop and pay homage to this tiny plant that covers large areas of poor volcanic soil above timberline, not so much for its beauty but because of the inhospitable situation in which it thrives. The stalks are seldom more than four inches in height and the single flower is about a half inch across. The leaves which lie close to the ground are thick and rounded. The Tolmie Saxifrage although not particularly beautiful is conspicuous because of the fact that it often grows in masses sufficiently dense to cover the ground. It blooms all through the summer from July until snow flies.

SQUAW GRASS, INDIAN BASKET GRASS, BEAR GRASS

Xerophyllum tenax Bunch-flower family

A plume of small white flowers growing on a tall stalk with a heavy bunch of tough, grasslike leaves at the base. (See page 140.)

WHITE FLOWERS GROWING IN MOIST PLACES

Grass of Parnassus

Parnassia fimbriata Saxifrage family

Among the late flowers of the high valleys none are more beautiful than the Grass of Parnassus with its violet-like leaves, pure white berry-like buds, and white flowers. The plant grows in moist waterways that have ceased to flow or alongside small streams. The flowers, which resemble a pure white buttercup in size and form, grow singly on slender stems but many stems grow from the dense rounded bunches of heart-shaped leaves. The flowers which are about a half inch across may be known by the fringe of white hairs along the edges of the petals. The flowers are abundant along the Skyline Trail between Paradise Inn and the river in several small stream beds, where they bloom late in August.

Marsh Marigold

Caltha leptosepala Buttercup family

One of the most abundant flowers of the high alpine meadows that blooms throughout July is this White Cowslip, the Marsh Marigold. It has violet-like leaves and narrow-petaled white flowers with gold centers and grows in marshy places along with the Shooting-Star and Duck's-Bill Lousewort. Where large snowdrifts keep the slopes wet the Marsh Marigolds may be found blooming as late as mid-August, but July marks the height of the season.

Cowbane, Cow Parsnip

Heracleum lanatum Parsley family

No one can mistake these large herbaceous plants with heavy ill-smelling leaves and large flat-topped heads of small whitish flowers, that grow in marshy places from the boundaries of the Park almost to timberline.

Devil's Club

Echinopanax horridum Ginseng family

No one who drives along the lower roads of the Park for the first time fails to notice the gigantic leaves of the Devil's Club which grows in the low marshy places. The leaves are somewhat the shape of maple leaves but heavy and often twelve to fourteen inches in breadth with a heavy, ten-inch petiole. The stems, often four feet high, are heavy and armed with long poisonous spines. At the tip is developed, early in the summer, a spike of small whitish flowers which in turn give place to a bunch of red berries.

RED FLOWERS OF THE OPEN PARKS AND MEADOWS

Red Heather, Purple Heather, Heath

Phyllodoce empetriformis Heath family

No flower is more abundant throughout late July and August in the mountain meadows, and no plant is more popular with the thousands of visitors than this Red Heather, which gives a purplish cast to entire landscapes when in full bloom. *Phyllodoce* is not a true heather but rather a heath closely related. The

plants, which grow in masses entirely covering the ground, on open hillsides between the belt of heavy forests and timberline, have woody, matted stems and short, evergreen needle-like leaves. The heather seldom grows more than a foot from the ground. The bells are open, varying from pink through old rose to dark red or purplish, and grow in clusters rather than singly as with the White Heather. The flowers are slightly larger than those of the White Heather, being a full quarter inch across the face. The height of the blooming season, which lasts for about a month, usually comes about the first of August. Other prominent flowers of the same period are the White Heather, Potentilla, Valerian, Arctic Lupine, and Indian Paintbrush.

Indian Paintbrush, Painted Cup

Castilleja oreopola Figwort family

The most brilliant of all the brilliantly colored high-altitude flowers is this rich red or crimson Indian Paintbrush. Few flowers bloom throughout a longer season, as the Paintbrush comes with the first bare ground and remains in bloom until the snow comes again in the autumn. During the height of the blooming season, normally about mid-August, the moist meadows flame with masses of solid color. Many of the finest specimens have a texture and depth of color not surpassed by the American Beauty Rose. The plants consist of a single stem with numerous narrow cleft leaves. The so-called flower is in reality only a radiate cluster of modified leaves or bracts which hide the real flowers which are green, inconspicuous, and tubelike. Because of its resemblance

to a round paintbrush dipped in red paint the popular name of Indian Paintbrush is very appropriate. Various species of *Castilleja* are abundant in open situations from sea level to above timberline. This particular species is most abundant in the high meadows about 5,500 feet elevation. Occasionally pure white specimens of this species are found. *Castilleja rupicola* is a similar species also abundant in the high meadows, but found in no other region than on Mount Rainier.

Orange Indian Paintbrush

Castilleja miniata Figwort family

This species which prefers drier and warmer hillsides is also very abundant in the mountain meadows although it never grows in such masses. The stalks are usually longer and the flower heads not so dense. This species is easily recognized by the lighter red or orange color of the flowers.

Fireweed

Epilobium angustifolium Evening Primrose family

Whether it is known as fireweed because of the fact that it is the first plant to cover burned-over areas following forest fires or because of the dense masses of flame-colored flowers it bears, is not known. No flower is more abundant along the roadways of the Northwest during midsummer than this tall *Epilobium*. It prefers open areas, such as roadsides, meadows, cut-over timberlands, and burns, from sea level almost to timberline. The plant stands from one to four feet in height on slender, annual stems which carry

the narrow four-inch leaves all the way up to the flowering spike, which is frequently as long as the stalk, and bears smallish rose-colored four-petaled flowers. The seed pod is long and slender. Late in the summer these pods open and free the down-winged seeds.

This particular plant is extremely widespread in its distribution, extending completely around the world between the latitudes of northern Alaska and California. Throughout Canada, Labrador, Greenland, Iceland, Scandinavia, and Siberia it is a common flower.

There are three other species of *Epilobium* that are common in the Park. The Yellow Epilobium of the boulder fields somewhat resembles the Fireweed except in color but the other two being dwarfed alpine forms are quite different

Shooting Star

Dodecatheon jeffreyi Primrose family

A peculiar cyclamen-like flower with a rosette of long oval leaves which prefers moist places. (See page 168.)

Duck's-Bill Lousewort

Pedicularis ornithorhyncha Figwort family

This plant with its finely divided basal leaves and cluster of small purplish-red flowers grows commonly in small stream beds. (See page 169.)

Elephant's-Trunk Lousewort

Pedicularis grœnlandica surrecta Figwort family

A plant somewhat similar to the Duck's-Bill Lousewort and preferring similar situations. (See page 169.)

Washington Lily, Wild Tiger Lily

Lilium parviflorum Lily family

A tall spotted lily common on warm slopes from sea level to timberline. The only true lily in the Park. (See Yellow flowers, page 178.)

Columbine

Aquilegia formose Buttercup family

A scarlet and yellow Columbine that prefers warm cliffs and steep slopes in the high valleys. This is the only Columbine occurring in the Park, where it is found up to timberline. In suitable situations the Columbine grows rank and in great profusion but it is not common. On the cliff just back of Paradise Camp and on the slope opposite Sluiskin Falls and in other similar places it finds its optimum. The stalks are branched, often two feet or more in height and bear many flowers. The leaves are beautiful compound affairs deeply cut. Late July and August is the time to look for Columbines. The only other variety of Columbine found in the Northwest is a yellow, closely related species.

Rosy Spiræa, Hard-Hack

Spiræa densiflora Rose family

No one can mistake the Rosy Spiræa for it is a typical member of this well-known family. The

flowers, which occur all through the summer, form dense rounded clusters composed of small red or old-rose colored flowers. The plants prefer open areas and grow in tangled thickets, the shrubs standing from one to several feet high. The leaves are oval, from one to two inches in length with serrated margins.

Between elevations of 4,000 and 5,000 feet the Rosy Spiræa grows commonly in marshy or boggy areas but in the alpine meadows above 5,000 feet elevation it changes its habitat greatly and grows best on stony hillsides.

Snowy Bramble

Rubus nivalis Rose family

The Snowy Bramble is a shrubby trailing plant with red strawberry-like flowers, red berries, and glossy, simple, usually three-lobed, leaves. It is not abundant but may be found along trails and on open hillsides above 3,000 feet elevation.

Dwarfed Huckleberry, Blueberry, Bilberry

Vaccinium deliciosum Blueberry family

The dwarfed huckleberry which covers large areas in the alpine meadows just below timberline, is a bushy shrub growing only a few inches in height. The pink globe-like flowers hang singly from the under side of the stem and bloom early in the summer. By late August the fruit, which is a small dark-blue berry, is ripe. The leaves are small and narrow and are deciduous.

Common Lousewort

Pedicularis racemosa Figwort family

This is the most abundant of the numerous species of Lousewort found in the mountain meadows. It prefers open areas from 3,000 feet elevation to timberline. The plants stand from six to ten inches in height and have opposite lanceolate leaves with finely toothed margins. The flowers occur in small clusters and are pinkish with twisted beaks.

Suksdorf Silene

Silene suksdorfii Pink family

This beautiful, but not common, pink is found blooming on the talus slopes of the high meadows late in August. The flower is pinkish white and less than an inch in diameter. Directly below the corolla is a large striped balloon-like pod which suffices to identify the plant. The leaves are very narrow and grow in opposite order. The stems are slender and from a few inches to a foot in length. Other flowers that prefer a similar habitat are the bluebell, orange paintbrush, and common lousewort.

Arctic Epilobium

Epilobium anagallidifolium Evening Primrose family

No one would imagine that this tiny-flowered, short prostrate-stemmed plant belongs to the same genus as the tall conspicuous Fireweed but such is the case. When the flowers have gone and the seed pod has developed the resemblance is more marked. The flowers are purplish-red in color, less than a quarter

inch in diameter, and four petaled. Most commonly found growing in the moss along streams but also found in the moist open meadows above 5,000 feet elevation.

Dwarfed Laurel

Kalmia polifolia microphylla Heath family

One is fortunate indeed if he succeeds in finding a clump of this tiny pink laurel. It grows close to the ground in boggy meadows and alongside the lakes of the high meadows. The flowers are saucer shaped, about a half inch across, and occur singly. The leaves are slender, oval, dark glossy green above and whitish beneath with edges curling under. The author has found it only near the inlet to Reflection Lake. Piper reports it at 7,000 feet elevation near the Nisqually Glacier.

Spring Beauty

Claytonia lanceolata Purslane family

This is the common Spring Beauty of the dry grassy meadows, above 4,000 feet elevation. The flowers are small, pink, and five petaled. The leaves are lanceolate and grow from a tuberous root which was used by the Indians as food

Valerian

Valeriana sitchensis Valerian family

A common plant with dense flattened bunches of small flowers that are usually white but sometimes with pinkish markings. (See White flowers, page 139.)

Mertensia

Mertensia lævigata Borage family

A herbaceous plant with clusters of beautiful pendant bells that are usually blue but sometimes pink. (See Blue flowers, page 182.)

RED AND PINK FLOWERS OF THE FORESTS

Twin Flower

Linnæa americana Honeysuckle family

As one drives along the roads in midsummer there occasionally comes to the nostrils a fragrance of flowers that is surprisingly noticeable in this region where sweet-scented flowers are unusual. Looking close, it is found that the low banks of the roadway are covered by a graceful trailing vine with tiny oval leaves arranged in opposite order along the slender tendrils. At the tip of each branch hang two beautiful pink bells the shape of honeysuckle flowers but less than half as large. Sometimes these dainty twin flowers are so numerous as almost to hide the mat of glossy leaves beneath.

The reason for the common name is very apparent. The Latin name was given in honor of the great Swedish botanist, Linnæus, who classified and named more plants no doubt than any other man. Although most abundant along roads and trails between 2,000 and 3,500 feet elevation the Twin Flower is found in suitable situations throughout the forested zones of the Park.

Salal

Gaultheria ovatifolia Heath family

A low twisted-stemmed shrub with heavy ovate leaves, small globe-shaped white or pinkish flowers, and

loose clusters of blue berries that is very common throughout the forests of the Park. (See White flowers, page 146.)

Blue Huckleberry, High-Bush Blueberry

Vaccinium macrophyllum Blueberry family

Each year tons of blueberries ripen in the meadows and old burns and go to waste. Other tons are eagerly devoured by the bears and grouse or are picked by Indians who come into the Park late each August to secure their year's supply of blueberries. The dwarfed blueberries, previously described, are abundant in the high meadows but the berries grow so close to the ground, the bushes are so small, and they ripen so late in the season, that they play little part in the economic life of either the bears or the Indians. In the lower park lands such as those found about Reflection Lake, Lake Louise, and Mountain Meadows below Mowich Lake and the burned-over areas throughout the Park, two other varieties of blueberries grow in great profusion. It is likely the Indians set many of the fires that have occurred in the area now included in the Park for the express purpose of increasing the crop of blueberries.

The high-bush blueberry or blue huckleberry grows on bushes from one to three feet in height and has serrated leaves. The berries, often the size of small grapes, stand up in the axils of the leaves, are almost black, and have no bloom. The flowers are small closed bells, pinkish white and not conspicuous. The fruit is fine flavored and makes excellent jams, jellies, and pies, a statement which is equally true of the lower-bush blueberries. There is a slightly different

flavor to each of the three species that are common but otherwise the fruit as well as the flowers are very similar.

Blue Huckleberry, Low-Bush Blueberry

Vaccinium ovalifolium Heath family

This blueberry, which is perhaps the most common of any found in the Park, grows on woody bushes from one to three feet in height in burned-over areas and open forests. The leaves are smaller than the high-bush variety and entire rather than serrated. The berries are usually slightly smaller, hang down rather than stand up, and are much lighter blue in color due to a light bloom that covers the berry. In normal years the plants fruit abundantly and furnish much of the late-season food for the bears and grouse. The flowers are pinkish-white and globe-shaped, about one-fourth inch in diameter.

Red Huckleberry

Vaccinium parvifolium Heath family

This is the common Red Huckleberry seen late in August and September all along the roadways from sea level to the upper edges of the forests. Within the Park it grows at its best in the Canadian zone at elevations about 3,500 feet. The bushes are tall with green stems and slender entire leaves. The flowers are dainty, pendant, almost closed bells of a pinkish color. They are not conspicuous but the fruit, which is abundant, is one of the most beautiful of transparent scarlet-red berries. The fruit is smooth, clear skinned,

about the size of small grapes, and when mixed with a suitable base makes excellent jell.

Red Flowering Currant

Ribes sanguineum Currant family

The Red Flowering Currant is among the first flowers to bloom within the boundaries of the Park. When Trillium and Yellow Violets are blooming in the woods and Skunk Cabbage is unrolling in the marshes the lower few miles of the roads just within the Park are lined with the brilliant crimson flowers of this beautiful shrub. When late in June the currants cease to bloom the woods do not know such brilliant colors again until the frost paints the leaves of the Vine Maple and Poplars scarlet and yellow. The bushes grow about four feet in height and bear thousands of small currant-like flowers that vary from pale to very dark crimson. The leaves resemble those of cultivated currants, the stems are reddish, and the fruit is inconspicuous.

Wild Bleeding Heart

Capnoides scouleri Poppy family

Associated with the sword and oak ferns and the Oregon wood sorrel of the moist lower forests such as those found near any of the Park entrances are two very common herbaceous plants that vie with the brackens in size and abundance. These are the Wild Bleeding Heart and a Western form of the Dutchman's Breeches. The Wild Bleeding Heart has pink heart-shaped flowers, large triangular leaves, and succulent stems. The plants are in bloom in May and June and later produce large seed pods that burst open upon being touched.

Dutchman's Breeches

Bikukulla formosa Poppy family

The Dutchman's Breeches, always popular with children wherever it is found, is much ranker in growth in the moist forests of the low valleys than it is in the East. The flowers are similar to the common forms but pinker in color. The leaves are large and of a rich green color in keeping with the fresh, sweet-smelling lower forests.

Oregon Wood Sorrel

Oxalis oregana Oxalis family

Another plant abundant along the roadways below 3,000 feet elevation is the clover-like-leaved Wood Sorrel with its single star-shaped, pinkish-white flower and its single compound leaf of three obcordate leaflets. The Oregon Sorrel is several times as large as the Eastern varieties which it otherwise resembles. The juice is extremely sour as with the Eastern species. In the moist fertile valleys such as that of Tahoma Creek, the sorrel frequently covers the ground over considerable areas.

Wild Ginger

Asarum caudatum Birthwort family

In the darkest spots of the moist lower woods where very few plants grow one may find patches of this peculiar plant. The leaves are heavy, about four inches across and heart-shaped, of a very dark green color. The root stalk, by means of which the plant

spreads, is a heavy rhizome. The flowers, which come early in May and June, are single dark reddish-brown cups with a star-shaped brim. They grow on short stems under the leaves, often in fact almost buried in the leaf mould of the forest floor.

Barber's Pole

Allotropa virgata Indian Pipe family

In the moist forests below 3,500 feet elevation there are a variety of leafless plants without green coloring matter which live upon decaying vegetable matter. The Indian Pipe previously described is one of the most abundant of these. Perhaps the oddest of the strange group is the asparagus-like Barber's Pole with its red and white striped stem and corollaless flowers. The plant stands from a few inches to a foot or more in height. This is a beautiful though peculiar plant.

Pine Sap

Pterospora andromedea Indian Pipe family

The Pine Sap with its tall reddish-brown stem and numerous stiff globular flowers arranged along the upper part of the two to four foot stalk is another of these peculiar plants common in the moist woods below 4,000 feet elevation.

Pyrola, Wintergreen

Pyrola bracteata Pyrola family

The Pyrolas of which there are numerous species in the forests below 4,000 feet may be recognized by their

thick shining evergreen leaves which resemble those of the pear tree. This accounts for the name pyrola. The wintergreen of commerce is obtained from the Eastern checkerberry rather than from these Western wintergreens. *Pyrola bracteata*, which is perhaps the most common, has the leaves arranged in a rosette at the base of a stem from six inches to a foot in length which bears a raceme of beautiful red inverted-bowl-shaped flowers.

Princess Pine, Pipsissewa

Chimaphila sp. Pyrola family

There are two species of Princess Pine common in the lower forests along with their relatives the Pyrolas which they resemble. The *Chimaphila umbellata* is a heavier plant than the Pyrolas with narrower oblanceolate leaves and an umbel of waxy red flowers. The *Chimaphila menziesii* is a much smaller plant with fewer and variegated leaves and fewer flowers, which are also somewhat waxy.

Calypso, Lady's Slipper

Calypso bulbosa Orchid family

This beautiful mauvish-pink lady's slipper is fairly abundant in the moist woods of the Canadian Zone where it blooms early in May and June. Unfortunately it is gone before the visitors begin to arrive in numbers and is seldom seen by them. There are numerous members of the Orchid family in the Park but most of them are small inconspicuous plants.

RED FLOWERS IN OR NEAR WATER OR MARSHY GROUND

Red Mimulus, Lewis Monkey Flower

Mimulus lewisii Figwort family

There are two flowers and a bird that one comes to associate inseparably with the wild rushing water of the high mountain streams. These are the Red and the Yellow Mimulus and the little slate-colored water ouzel. Late in August the Mimulus, of which the red variety predominates, turns the white-watered stream, from the glaciers to the forests, into wonderful Japanese Gardens. Paradise River and similar streams become lined with dark red flowers that droop down until they touch the water and cover the spray-drenched rocks in mid-stream with crimson bouquets. The Lewis Monkey Flower is about an inch across the face, a short tube with a snapdragon-like corolla, which grows on a bushy herbaceous stem with opposite dentate leaves. Abundant from 4,000 to 6,000 feet elevation.

Shooting Star

Dodecatheon jeffreyi Primrose family

The Shooting Star is readily recognized by its resemblance to the Cyclamen with which it is closely related. The dark pink or purplish flowers have black centers and petals and grow in small clusters at the end of a slender, six to ten inch, stalk. The oblong lanceolate leaves form a rosette at the base of the stalk. These are common flowers along with the Marsh Marigold and Buttercup in wet marshy places. Mid-

July to mid-August marks the height of the season. Abundant in the alpine meadows to timberline.

Duck's-Bill Lousewort

Pedicularis ornithorhyncha Figwort family

Following the Shooting Stars and Marsh Marigolds late in August one may expect to find in the moist stream beds of the high alpine meadows two louseworts that are among the most peculiar and interesting of the alpine flowers. The Duck's-Bill Lousewort may be known by its feathery, purplish-green leaves and shortened heads of peculiar reddish-purple flowers. Part of the corolla has been modified into a short conical beak about half an inch in length that closely resembles in shape the head of a miniature wild duck. This accounts for the common name Duck's-Bill.

Elephant's-Trunk Lousewort

Pedicularis grœnlandica surrecta Figwort family

Similar to the Duck's-Bill Lousewort in type of habitat preferred, time of blooming, and general type of flower is the Elephant's-Trunk Lousewort. This plant is abundant in certain restricted areas but is not as widespread as other members of the genus. Like the Duck's-Bill a part of the corolla has been modified into a beak but in this case a long filament-like appendage that has the same shape and position as the head and trunk of an elephant. Two unmodified petals form broad floppy ears so that it requires very little imagination to see the heads of miniature African elephants standing in an elongated spike on the short flower stalk.

The leaves are finely divided, purplish-green, and resemble those of the Duck's-Bill Lousewort. Neither of these two strange plants bear much resemblance to their close relatives the Common Louseworts.

Rosy Spiræa

Spiræa densiflora Rose family

A low shrub with dense corymbs of rose-colored flowers common in swampy areas at about 4,500 feet elevation. (See page 157.)

Arctic Epilobium

Epilobium anagallidifolium Evening Primrose family

A tiny red four-petaled flower abundant in late summer growing in wet moss along the streams of the alpine valleys. The seed pods are long and slender. (See page 159.)

RED FLOWERS FOUND AMONG ROCKS

Turtlehead

Chelone nemorosa Figwort family

This close relative of the Pentstemons is a beautiful plant standing two feet or more in height with opposite serrate leaves and heavy corymbs of purple-red flowers that resemble those of the garden foxglove in size and shape. They are occasionally found on dry slopes and cliffs at about 5,000 feet elevation but are most abundant in the old boulder beds of the river valleys below 4,000 feet.

Pentstemon, Wild Foxglove

Pentstemon rupicola Figwort family

Several varieties of Pentstemons, all of them beautiful, are common in the Park. The most brilliantly colored and most interesting of all is this *Pentstemon rupicola* which is usually found growing on the precipitous face of rock cliffs. Looking up one sees a spot of brilliant rose-crimson against the face of the cliff and that is all. When examined more closely the plant is found to be a small shrub with short prostrate stems and broadly ovate leaves that are thick and somewhat glaucous. The leaves are not as long as the tube-shaped foxglove-like flowers which are borne in July and August in great profusion. A similar species with flowers that are darker and more purplish is *Pentstemon menziesii* with similar serrated leaves that are not glaucous. Both species occur on cliffs up to about 8,000 feet elevation but are more commonly found from 4,500 to 6,000 feet elevation.

Salmon Berry

Rubus spectabilis Rose family

A common shrub of brier-like appearance found usually on talus slopes up to 5,000 feet elevation. In July the star-shaped red flowers are conspicuous; later, in August, the heavy yellow or the claret-colored berries are much in evidence. The stems are erect and prickly. The leaves are compound with three or five leaflets. The berries are edible but not well flavored. Two forms of this species occur, one bearing yellow berries and the other bearing wine-colored berries which are somewhat better flavored than the yellow variety.

ROSY SPIRÆA

Spiræa densiflora Rose family

A low shrub with dense corymbs of rose-colored flowers common in bogs at about 4,500 feet, and on rock cliffs up to 6,000 feet elevation. (See page 157.)

COLUMBINE

Aquilegia formosa Buttercup family

A scarlet and yellow Columbine of the alpine meadows found on steep slopes and rock cliffs. (See page 157.)

SPRAGUEA

Spraguea multiceps Purslane family

A handsome plant with entire spatulate leaves and dense heads of pink or purplish flowers. Common in the pumice fields. (See the following species.)

RED OR PINK FLOWERS FOUND ABOVE TIMBERLINE

SPRAGUEA

Spraguea multiceps Purslane family

In the volcanic ash and cinders above timberline, growing along with the Tolmie Saxifrage and the Lyall Lupine, one is apt to find the *Spraguea multiceps* with its thick rootstalk which bears several short stems with entire spatulate leaves and heads of pinkish-brown flowers. This is a peculiar plant but typical of the

high windswept ridges where life is a constant struggle for both plants and animals.

Pentstemon, Wild Foxglove

Pentstemon rupicola Figwort family

This is a brilliant rose-scarlet foxglove-like flower with shrubby stems and small thick leaves. Common on rock cliffs. (See page 171.)

YELLOW FLOWERS OF THE OPEN MEADOWS

Potentilla, Cinquefoil

Potentilla flabellifolia Rose family

This common Potentilla or Cinquefoil of the meadows is perhaps the most abundant and widespread flower of the alpine meadows such as those of Paradise Valley. It comes close upon the heels of the Avalanche Lilies and blooms until late August. At first glance the Potentilla is frequently mistaken for a buttercup, as in shape, size, and color it greatly resembles the Suksdorf Buttercup which is also abundant in the same habitat. The two may be distinguished at a glance, however, by the notched petal, the green sepals, the duller more opaque color, and the compound leaf with three finger-like leaflets of the Potentilla. The buttercup is slightly more cupped, does not have a notch at the tip of the round, transparent yellow petals; the sepals are straw-colored and the leaves are smooth-edged, deeply cut, and not numerous.

There are at least four other species of Potentilla found in the Park. These are *P. dissecta*, *P. glancophylla*, *P. villosa* and *P. fruticosa tenuifolia*. None of these, however, are numerous.

Suksdorf Buttercup

Ranunculus suksdorfii Buttercup family

This exquisite little plant is abundant throughout July in the high meadows at about 5,500 feet elevation, where it selects moist places, often growing with the Avalanche Lily near the edge of the melting snowdrifts. It is the only buttercup growing in such localities so there can be no mistaking it except for the Potentilla (see above). The plant stands from five to ten inches in height, has smooth-edged, three to five-cleft leaves and bowl-shaped waxy yellow flowers about a half inch across. The Buttercup Family is very large but not more than one or two other species occur in the Park and these are rare.

Yellow Avalanche Lily, Glacier Lily

Erythronium parviflorum Lily family

Early in the summer following close upon the melting snowdrifts the most striking flower fields of the whole season are found in the high alpine meadows. These are composed largely of the White Avalanche Lily or Deer's-tongue, but here and there among the avalanches of white flowers are smaller masses of the Golden Yellow Avalanche Lily. With its two uniform-colored and smooth-edged, lanceolate leaves, slender stalk, and star-like flower it differs from its cousin only in color and the fact that the yellow lily seldom has more than one blossom on the stalk while the white commonly bears from one to five and sometimes more. The yellow variety apparently prefers moister and richer soil than the white which may account for the fact that it is less widespread.

Yellow Violet

Viola sp. Violet family

Two species of Yellow Violets are found in the zone between 3,000 and 6,000 feet elevation—*Viola sempervirens* and *Viola glabella*. These are nowhere abundant and are very similar in appearance. Both are small and prefer moist meadows and both have round cordate leaves. The fact that the stems of *V. sempervirens* are usually prostrate while those of *V. glabella* stand erect helps to distinguish the two species.

Mountain Dandelion

Agoseris alpestris Chicory family

A common yellow flower of the August flower fields in the high valleys is this mountain dandelion. Both the rosette of notched lanceolate leaves and the solitary button-like heads of flowers on hollow stems resemble those of the common dandelion so often considered a pest about developed sections of the country. The chief difference noticeable at a glance is the squarish end of the petals and lighter, less dense heads.

Arnica

Arnica latifolia Aster family

Along with the numerous asters of the late summer in the high alpine valleys are several sunflower-like flowers of the Arnica Family. Most abundant of these is *Arnica latifolia*, a smooth, cordate-leaved plant with from one to five or six heads about an inch in diameter growing on a stalk from one to three feet in height. It is from plants of this family that the arnica of medicine is distilled.

Senecio triangularis Aster family

A closely related species of the Arnica group that is very common throughout late July and August in the high valleys is this *Senecio triangularis* with its triangular-lanceolate, coarsely toothed leaves, tall stems and heavier clusters of small yellow flowers about a half inch in diameter.

Lutkea, Alaska Spiræa

Lutkea pectinata Rose family

A small shrub two to three inches tall forming dense matts. The plant is recognized by its three-cleft leaves and erect racemes of small creamy flowers. It is abundant in the alpine meadows at from 5,000 to 6,000 feet elevation. (See White flowers, page 142.)

Yellow Heather

Phyllodoce glanduliflora Heath family

Of the three heathers common in the mountain meadows the Yellow Heather is least abundant. The low shrubby bushes with evergreen needle-like leaves and tough matted stems can hardly be told from the common red heather but the flowers, which are almost closed and yellowish white in color, are quite different. The Yellow Heather is common between 5,000 and 7,000 feet elevation, preferring broken lava and rocky hillsides although often found mixed with the red heather on the open slopes.

Pentstemon

Pentstemon confertus Figwort family

This interesting pale yellow Pentstemon abundant in suitable situations between 5,000 and 8,000 feet ele-

vation, produces a compact bunch of short tubelike flowers on a stalk only from two to four inches in height. The same species when found near sea level grows from one to two feet in height. The leaves are small with entire margins. A similar species with blue flowers, *P. procerus*, occurs with the yellow. Both are often found blooming late in August in the vicinity of timberline.

Lousewort

Pedicularis contorta Figwort family

Of the two common louseworts found in the high parks from mid-July to September the creamy yellow *Pendicularis contorta* is the more beautiful. The beaked flowers are borne in a raceme often four inches in length. The purplish leaves are fernlike and largely basal. These, as well as the pinkish Common Lousewort, are particularly abundant late in August along the Skyline Trail. Wort is an Old English word meaning "herb." The common name, although it may be descriptive, is not worthy of so beautiful a flower.

Indian Warrior, Pedicularis

Pedicularis bracteosa Figwort family

Another lousewort with fernlike leaves and a stalk of yellowish-white or greenish-yellow flowers is abundant on moist hillsides along with several other species of Pedicularis. It may be known from the *P. contorta* by its more solitary habits, taller, heavier stalks, green leaves, and broad hoodlike beak in contrast to the slender inrolled beak of *contorta*. The brown seed stalks, standing about a foot in height, are conspicuous late in the season.

Columbine

Aquilegia formosa Buttercup family

The common yellow and scarlet Columbine of the high alpine valleys. (See Red flowers, page 157.)

Wild Tiger Lily

Lilium parviflorum Lily family

The Wild Tiger Lily occurs on dry slopes in the lower valleys, as it does at sea level, and is also abundant in suitable situations as high as 5,500 feet elevation. This is the only true lily found in the Park. No one can mistake the heavy backward curving petals with their black spots. Sometimes the flower stalks grow three or more feet in height and bear a dozen or more flowers. Blooms in June in the lower valleys and in August in the alpine meadows.

YELLOW FLOWERS OF THE FORESTS

Oregon Grape

Berberis aquifolium Barberry family

The glossy evergreen leaves of the Oregon Grape attract their share of attention all along the roads and trails. The leaves grow from a central rootstalk and have from five to eleven stiff holly-like leaflets on each leaf stem. The yellowish-white flowers are small, occur early in the summer and are not conspicuous. By late August grape-like bunches of dark-blue edible berries are beginning to ripen. Abundant throughout the forested sections of the Park preferring drier open woodlands. It is commonly associated with the Salal and Red Huckleberry.

YELLOW FLOWERS NEAR WATER OR MARSHY AREAS

Skunk Cabbage

Lysichiton camtschatcense Arum family

The broad green leaves of the Skunk Cabbage predominate among the herbage of the swampy areas frequently found in the low valleys. The flower consists of a heavy brown stalk cloaked in a bright yellow leaf resembling somewhat the Jack-in-the-pulpit of the east. At sea level they bloom as early as April but within the Park June and July mark the blooming season. The leaves are smooth-edged, oval, and average twenty inches in length by eight to ten broad. The peculiar odor of the plant gives rise to the popular name.

Alpine Mimulus

Mimulus alpinus Figwort family

Late in August when the Red Mimulus dominates the landscape in the region of the glacial streams of the upper valleys great quantities of the Yellow Alpine Mimulus may also be found in the vicinity. All through August, along streams above 3,500 feet elevation and on cliffs where there is dripping water, this brilliant yellow flower paints patches of gold, but it is not until late in the season that the dwarfed variety, which grows so abundantly among the wet mossy rocks of the upper streams, is in bloom. Just below the line of perpetual snow it may be found with the stems so stunted that one must look close to see more than the flower itself above the moss. The leaves are lanceolate, entire, and arranged in opposite order along the stems.

Suksdorf Buttercup

Ranunculus suksdorfii Buttercup family

The only Buttercup found in the high alpine meadows. Blooms abundantly in moist places throughout July. (See page 174.)

Yellow Fireweed

Epilobium luteum Evening Primrose family

The Yellow Fireweed, which resembles somewhat the tall flame-colored common fireweed, flourishes along the small streams in the lower meadows below 3,500 feet elevation and among the boulders of the river bars. It may be known by its creamy yellow flowers about a half inch in diameter and ovate to lanceolate opposite leaves on a stem from one to two feet in height.

YELLOW FLOWERS FOUND ABOVE TIMBERLINE

Golden Aster

Erigeron aureus Aster family

This beautiful little Golden Aster is one of the characteristic flowers of timberline and somewhat above where it is associated with the Lyall Lupine and the Mountain Phlox. The bright golden-colored ray flowers stand singly on stems from three to four inches high with spatulate leaves that are largely basal.

Yellow Mustard

Draba aureola Mustard family

This hardy plant is sometimes found growing on the rocky cleavers between the glaciers at about 10,000

feet elevation. The short stems are very leafy with short oblong leaves. The entire plant is covered with a dense growth of minute hairs. The tiny flowers are a bright yellow color.

Another member of the same family but with white flowers, the *Smelowskia ovalsi*, is associated with the *Draba aureola* in this inhospitable region. These two plants reach a higher altitude than any other flowering plants on the mountain.

YELLOW FLOWERS OCCURRING AMONG ROCKS

Stonecrop, Sedum

Sedum divergens Stonecrop family

Everywhere on cliffs in the high valleys from 4,000 feet elevation to timberline one notices the small round and globular leaves of the Stonecrop.

The bright yellow goldenrod-like flowers are borne on a flower stalk from two to six inches in length. Blooms throughout August.

BLUE FLOWERS OF THE OPEN MEADOWS

Arctic Lupine, Blue Bonnets, Buffalo Clover

Lupinus subalpinus Pea family

The Arctic Lupine is one of the typical mid-season flowers of the high alpine parks where it blooms in late July and August in great profusion.

The great numbers of radiating flower stalks with their long racemes of purple-blue pealike flowers and beautiful palmately compound leaves makes this

common Lupine one of the most attractive flowers of the valleys. Occasionally a plant bearing pink or even pure white flowers is found among the others. The plant stands from ten to twenty inches in height and prefers the open sunny meadows above 5,000 feet elevation. A dwarfed species of Lupine, the Lyall Lupine, is abundant at and above timberline.

Mertensia, Virginia Bluebell

Mertensia lævigata Borage family

From mid-July to late August the exquisite clusters of small blue bells, the thin oval leaves with entire edges, and the fresh greenness of the Mertensia add much to the pleasure of the upper trails. The plant is herbaceous, stands from two to three feet in height, and is very abundant on warm slopes between 4,500 and 5,500 feet elevation. The tiny blue bells about a half inch in length often have a trace of pink to them and oftentimes the unopened buds are entirely pink giving the clusters a pleasing variegated appearance.

Purple Aster

Eucephalus ledophyllus Aster family

This is the common pinkish-purple Aster of the high alpine parks so abundant from mid-July until the snows come in September. The heads are about an inch and a quarter in width and usually grow singly on a leafy stem from one to two feet in height. The leaves are lanceolate and entire from two to four inches in length and pubescent on the under side. This is the earliest Aster to bloom in the meadows and the only one anywhere near its size to grow singly on its stem.

Short-Stemmed Aster

Oreastrum alpigenum Aster family

This is the beautiful little Aster with a stem from three to six inches in length and deep purple rays, so common in the open meadows from the elevation of Reflection Lake (4,861 feet) to the barren rock ridges well above timberline (8,000 feet). The rayed heads are single, from an inch to an inch and a half in width, and the leaves, which are slender, are often curiously twisted. It blooms from mid-August until September.

Aster

Erigeron salsuginosus Aster family

This pinkish Aster is one of the common late season flowers of the high meadows between 4,000 and 6,000 feet elevation. It is a tall species with large, flat, rather broad leaves.

Polemonium, Jacob's Ladder

Polemonium humile Phlox family

This handsome blue flower with its ladder-like pinnately parted leaves is common in July and August when it blooms in the alpine meadows above 5,000 feet. The flowers are borne in small clusters and are about a half inch across the face.

Bluebell, Harebell

Campanula rotundifolia Bellflower family

Everyone welcomes the sight of these dainty Harebells when in August they begin to bloom on the dry

slopes, usually at the foot of cliffs between 5,000 and 7,000 feet elevation. The bell is borne singly at the end of a slender grasslike stalk from six inches to a foot in length. The leaves are very narrow and slender, the upper ones at least being entire. The bluebell is usually associated with the orange paintbrush, the louseworts, and the rosy spiræa.

Cussick's Speedwell

Veronica cusickii Figwort family

This dainty flower, although tiny, grows in such profusion as to form spots of bright violet-blue here and there on the slopes of the alpine meadows where it associates with the asters, paintbrushes, and lupine late in July and early August. The flowers are a rich violet-blue and are borne in small racemes on stalks from three to six inches in height. The leaves are smooth and oval and arranged along the short stem in opposite order. The flower is darker blue and about twice the size of the alpine species.

Alpine Speedwell

Veronica alpina Figwort family

When the bright blue Cussick's Speedwell has begun to disappear in the meadows of the high valleys one may begin to watch for the pale blue Alpine Speedwell which is never so abundant and prefers moister situations. The flowers are smaller and lighter in color but otherwise the plant is very similar, consisting of a short stem with small oval leaves arranged in pairs along the stem. August is the flowering season of the Alpine Speedwell.

Blue Gentian

Gentiana calycosa Gentian family

One of the most admired of the blue flowers of the Park is this Gentian of the moist upper meadows. In suitable situations the blue Gentian is one of the most common of the late season flowers. It prefers moist places from the edge of the forests to timberline and blooms from mid-August until covered with the first snows in September. Even after the early snows have come and gone the Gentians and the Asters continue to bloom. The deep-blue bells stand upright, usually singly, on straight stems from six to twelve inches in height. The bells, which are an inch or more in length, open only when the sun shines, remaining tightly rolled at night and during stormy weather. The leaves are oval, entire, and arranged in pairs along the stem. This is the only species of Gentian occurring in the Park.

Pentstemon

Pentstemon procerus Figwort family

This dainty blue Pentstemon, which is similar to *Pentstemon confertus* except in color, is abundant from sea level to well above timberline. Within the Park it seems most abundant near the termini of the primary glaciers, where it stands about a foot in height with dense bunches of one inch tube-like flowers, and above timberline where it is only a few inches in height and the flowers less than a half inch in length. The same statement is true of the yellow variety mentioned above. Both plants bloom throughout July and August at the lower levels but not until late

August at timberline. The small oval leaves have entire margins.

Blue Violet, Dog Violet

Viola retroscabra — Violet family

This tiny blue Violet with oval leaves is abundant in suitable situations late in July and early in August but is never conspicuous because it is so short-stemmed that it is often hidden by the grass and other herbage. Along with the little yellow violet, *Viola sempervirens*, it prefers moist open meadows at about 5,500 feet elevation. Other species grow in the low forest-bound meadows such as those at Longmire Springs and the common swamp violet is sometimes found in the marshes. At least five species of the genus Viola have been listed in the Park but nowhere are they abundant.

BLUE FLOWERS THAT GROW IN WET PLACES

Blue Gentian

Gentiana calycosa — Gentian family

An elegant plant with upright, deep-blue bells and small oval leaves arranged in opposite order that blooms in profusion in moist, fertile meadows, and near small streams and ponds, from late August until September. (See page 185.)

Alpine Speedwell

Veronica alpina — Figwort family

A small plant two to four inches high, with several pairs of small, ovate, pubescent leaves, and a terminal

raceme of small pale blue flowers, that is common late in August near small streams and in marshy spots of the high alpine meadows. (See page 184.)

BLUE FLOWERS FOUND AMONG ROCKS

Mountain Phlox

Phlox diffusa Phlox family

The traveler who climbs to the rocky ridges between 5,000 and 7,000 feet elevation or follows up the rough moraines of the glaciers is sure to meet this hardy little flower. The Mountain Phlox although beautiful in itself perhaps attracts more attention because of the inhospitable situations in which it thrives. It is usually found associated with the Tolmie Saxifrage and the Lutkea on dry rocky ridges or pumice fields just above timberline where it clings close to the ground as a protection against the high sand-filled winds. The leaves are tiny needle-like affairs that are seldom noticed because the blue or lavender flowers are so much more conspicuous.

The phloxlike blossoms are about three-quarters of an inch across, sky-blue when they first open but change through lavender to pink and white as they become older, and occur in such profusion that they often form a carpet of blue over considerable areas. Mid-July to late August is the flowering season.

Bluebell, Harebell

Campanula rotundifolia Bellflower family

A charming and abundant bluebell common on dry slopes and at the base of cliffs from 4,000 to 7,000 feet elevation in mid-season. (See page 183.)

PENTSTEMON

Pentstemon menziesii Figwort family

A low, often prostrate plant with evergreen toothed leaves and small dull purple flowers occurring at timberline and in sheltered situations up to 8,000 feet elevation. (See page 189.)

BLUE FLOWERS COMMON ABOVE TIMBERLINE

LYALL'S LUPINE

Lupinus lyallii Pea family

The Lyall's Lupine is without doubt the most typical flower of high meadows and pumice fields at timberline and above (6,000 to 8,000 feet elevation). With the plants of the Arctic-alpine zone the flowering season is directly dependent upon snow conditions which vary greatly from year to year so it is practically impossible to name seasonal limits. In favorable situations the beautiful little plant may be found in bloom from mid-July until late in the season. The silvery palmate leaves form a rosette near the ground which bears several short stems each with a raceme of brilliant, blue-purple, pealike flowers. This lupine closely resembles the Arctic Lupine except that the flowers are smaller and darker and the smaller leaves are densely pubescent. This lupine is usually associated with the Mountain Phlox and the Golden Aster.

MOUNTAIN PHLOX

Phlox diffusa Phlox family

A prostrate plant with tiny leaves which when in bloom forms dense matts of pale blue. Prefers

rocky soil from 5,000 to 7,000 feet elevation. (See page 187.)

Short-Stemmed Aster

Oreastrum alpigenum Aster family

A low plant with narrow tufted leaves and short stalks bearing one, or rarely two, large violet heads that is common in pumice fields and on dry slopes from 5,500 to 8,000 feet elevation. (See page 183.)

Pentstemon

Pentstemon menziesii Figwort family

A low, often prostrate, pentstemon with small evergreen, oval leaves that are stiff and heavy, with sharply serrated margins. The flowers as well as the plant closely resemble *Pentstemon rupicola* except that the flowers are a dull purple rather than crimson. *Pentstemon menziesii* is often found growing in the crevices of rocks at timberline and somewhat above late in July and August.

Pentstemon

Pentstemon procerus Figwort family

A species with small entire leaves and dense clusters of small blue flowers borne at the tip of the flower stalk. Near moist cliffs at about 4,000 feet elevation this blue pentstemon stands from one to two feet high but at elevations from 6,000 to 8,000 feet where it also occurs the flowers are tiny and the plant only a few inches in height. (See page 185.)

Polemonium

Polemonium elegans Phlox family

This handsome little plant with its feathery leaves and pale blue flowers with large yellow centers is sometimes found in the pumice above timberline. The pinnate leaves are only a few inches in length and are very glandular. The flowers somewhat resemble phlox and are about a half inch in diameter.

GREEN FLOWERS OF THE OPEN MEADOWS

Giant Hellebore, False Green Hellebore

Veratrum viride Bunchflower family

A peculiar plant is the Hellebore, one that attracts comment, from the time the heavy rolls of broad leaves begin to force their way through the snow or the soil alongside the snow banks, until the large drooping panicles of green flowers become a conspicuous part of the high meadow flower fields late in August. Early in July the huge green rolls of parallel-veined leaves appear all over the high valleys and soon open and develop into a plant from one to three feet in height with the lily-like leaves, a foot or more in length and often six inches wide, arranged in alternate order along the herbaceous stem. Almost immediately the flower stalk begins to put out long drooping branches which later burst into sprays of peculiar, star-shaped, green flowers. A valuable drug known as *Veratrum viride* is extracted from this plant and used extensively as a heart depressant. Hellebore powder used as an insecticide is also made from plants of this genus.

Mountain Currant

Ribes acerifolium Currant family

The Mountain Currant is the most abundant of all the Currant Family found in the Park. It is a common shrub found particularly along streams or at the base of the clumps of trees in the high alpine meadows. It may be known by its rough maple-shaped leaves and thornless stems. The flowers are not conspicuous being small and of about the same green color as the leaves. The berries which ripen late in the summer are also green, are covered with short stiff hairs, and are far from being edible.

GREEN FLOWERS OF THE FORESTS

Mountain Currant

Ribes acerifolium Currant family

The common currant of the high alpine meadows and the upper fringe of open forests at about 4,500 feet elevation. Both the flowers and the mature berries are green in color and not conspicuous. (See above.)

CHAPTER VIII

Ferns of Mount Rainier National Park

Some seventeen species of ferns have been recorded in the Park. Of these, however, only about half are common. Because of limited space and meager knowledge those that are not likely to be noted by the average observer will be omitted.

In the damp lower forests particularly, such as those found along the first six or eight miles of any of the approach roads, ferns grow luxuriantly and add a great deal to the beauty of the roads and trails. Here some seven or eight species are very abundant and may be found within a space of a half mile, often, on any of the lower trails such as the Trail of the Shadows at Longmire Springs; some two or three more would be classed as common in the drier rock slides and meadows of the high valleys. Only one species, the woolly-leafed lace fern, is found in the unhospitable habitat above timberline and this is not anywhere abundant. The ferns of the moist lower forests in the humid Transition and lower Canadian zones will be listed first.

Common Bracken

(*Pteridium aquilinum pubescens*)

The common bracken or brake so abundant in the Park is the most common "weed" of the Northwest. It cannot be denied, however, that were it not for its

rapid, rank, growth the cut-over and burned-over areas and the open roadsides would be far more barren and less attractive than they are. The broad fronds, from three to many in number, are borne on a single heavy brittle stem sometimes a half inch or more in diameter and from one to four feet in length, although the average height is about two feet. The bracken dies and becomes dry and brown late in the fall. It is very coarse and stiff, but not unbeautiful and grows in dry, open areas, where no other fern would survive the heat. Both the tender rootstalk and the new asparagus-like tip of the bracken are edible and were used extensively by the Indians as food.

Christmas Fern, Sword Fern

(*Polystictum munitum*)

The Sword Fern is one of the most common and well-known ferns of the Park as well as being one of the most beautiful. The fronds, often six inches in width and three feet long, rise in heavy graceful clumps from a central rootstalk The leaves, lancelike in shape, from two to three inches in length and a half inch wide, are dark green with finely toothed margins, and grow in alternate order on the long swordlike fronds. The Sword Fern is an "evergreen" fern.

It reaches its highest development in the rich soil and shady retreats of the lower valleys where along with the Deer Fern and Oak Fern it contributes generously to the fresh, cool loveliness of the forests.

Deer Fern

(*Struthiopteris spicant*)

Everywhere along the forest roads and trails the conspicuous dark green rosettes of the Deer Fern are

common. The prostrated vegetative fronds are usually about a foot in length and two to three inches in width, with smooth-edged lance-shaped leaves arranged in alternate order along the stem. The entire base of the leaves is attached to the stem, differing in this respect from the Sword Fern. These are evergreen.

Early in the spring, feathery, contracted, fruit-bearing fronds unfurl. These stand upright in a graceful mass from the center of the darker green rosette of evergreen fronds. In the fall these dainty fronds having served their purpose die down and disappear.

The Deer Fern prefers rich moist soil and the cool shady forests of the Transition and Canadian zones. It is particularly abundant along the roads and trails below 4,000 feet elevation.

Western Lady Fern

(*Dryopteris oreopteris*)

Another fern very abundant in the moist woods is the Western variety of the common Lady Fern with its heavy tufts of broad fronds with compound leaves, sometimes four to five inches in length, arranged irregularly on the stem. The individual leaflets are under one inch in length, finely serrated and usually bearing from six to ten kidney-shaped sori or spore cases on the under side. The fronds are often two feet in length and grow in heavy clumps which die down in the fall.

Wood Fern

(*Dryopteris spinulosa dilatata*)

Very similar to its close relative the Lady Fern and equally abundant all through the lower forests is the

Wood Fern. This species is somewhat rougher in appearance and more finely divided than the Lady Fern and has round fruit-dots or sori instead of kidney-shaped ones but in general appearance and type of habitat preferred, the two have much in common.

Oak Fern

(*Phegopteris dryopteris*)

Everywhere abundant in the mossy woods is the dainty, dark-stemmed Oak Fern. The single slender stem, usually about six inches in length, carries three triangular fronds with finely divided, compound leaves. The central or terminal frond is usually considerably larger than the other two. At first glance this beautiful fern is similar to the Maidenhair Fern and is often mistaken for it. The leaves are heavier and not so transparently green as the Maidenhair, and drier localities are preferred in which to grow. The fronds of the Oak Fern disappear entirely in the late fall.

Maidenhair Fern

(*Adiantum pedatum aleuticum*)

The Maidenhair, most loved of all ferns, is fairly abundant in the Park along streams and on wet cliffs in the lower valleys near the boundaries. The slender black stems bear three rounded fronds with filmy, light green leaves with one entire and one lobed and serrated edge. This beautiful fern is not widely distributed within the Park but is fairly abundant along Tahoma Creek, a mile or so from the Nisqually road, and along small west side streams, such as St. Andrews Creek and Crater Creek

Licorice Fern

(Polypodium occidentale)

On moss-covered rocks, trees, and fallen logs one may expect to find imbedded the brittle rootstalks of the Licorice Fern, which is abundant wherever suitable situations occur throughout the forested areas of the Park. The fronds grow singly from the moss on short green stems. The leaflets apparently have smooth margins but are really finely toothed. They are attached along the entire base and are arranged in alternate order very close together. The fronds, seldom over a few inches in length, are oval in general outline tapering so decidedly at the tip that the leaflets become merely lobes of the frond. This interesting polypody gets its name from the fact that the succulent rootstalk has a strong licorice taste that cannot be mistaken.

Nootka Rock Brake, Parsley Fern

(Cryptogramma acrostichoides)

Here and there among the boulders of the river bars and bare rock slides are found rounded tufts of the lacy fronds of *Cryptogramma acrostichoides*. Sometimes these balls of fronds are a foot or more in diameter but more often only a few inches. The leafstalks grow direct from a short, chaffy, rootstalk with masses of fibrous roots, are oval in general outline with short light green stems. The leaflets are deep cut, doubly compound, and finely divided. In midsummer spore-bearing fronds unfurl in the center of the group and in the fall the entire plant dies down.

This species grows in the bright sunlight of the open boulder beds following up the rivers to the very edge of the receding ice and sometimes along the lateral

(Photograph by Curtis)

The Forest Floor in the Lower Valleys is Carpeted with a Rank Growth of Ferns and other Shade Loving Plants. Sword Fern in the Foreground with Lady Ferns and Brackens Beyond

moraines of the glaciers to an elevation of 6,000 feet. A splendid clump has bloomed for years on the moraine of the Nisqually alongside the trail from Paradise to the glacier. The Rock Brake is abundant all along the river bars of the Nisqually and other Park rivers and on rock slides of the upper ridges as far as timberline.

Brittle Fern

(*Filix fragilis*)

A tiny fern, in clumps often no larger than one's fist, that grows among the rocks of the high ridges from the alpine meadows to well above timberline, is the Brittle Fern. In general appearance the Brittle Fern resembles the *Cryptogramma* but is a lighter color, less lacy in appearance, and does not grow in such rounded and compact clumps. In Paradise Valley the Brittle Fern prefers such regions as the vicinity of Sluiskin Falls and the rock ledges just below the Paradise Glacier.

The leaves are thin and oblong lanceolate in shape. The leafstalks are slender and brittle, hence the name.

Lace Fern

(*Cheilanthes gracillima*)

On high wind-swept ridges and peaks such as Pinnacle Peak and the ridges along the summit route one may sometimes find in the shelter of the rock crevices the diminutive woolly lace fern. The fronds are seldom more than three or four inches in length and the tiny leaflets twice divided are covered with soft furry down—a very appropriate coat for so unhospitable a climate. Sometimes this unusual fern is found on cliffs as low as 4,000 feet where it is associated with the Mountain Polypody, a close relative of the Licorice Fern.

Other ferns that are found in the Park but are not particularly abundant are the Mountain Polypody (*Polypodium hesperium*) which is found among the rocks at the base of the minor peaks, particularly those of the Tatoosh Range in the vicinity of Cliff Lake and Reflection Lakes; the *Phegopteris alpestris*, a close relative of the Oak Fern which forms lacy tufts in the talus at the foot of cliffs in the alpine parks such as those found along the Skyline Trail between Paradise Inn and the Paradise River; and the Holly Fern (*Polystichum lonchitis*), with leathery, evergreen leaves, which occurs in the high meadows and on the outlying peaks.

Two species of the Adder's Tongue family (*Ophioglossaceæ*) known as Grape Ferns but not closely related to the true ferns occur. Of these the *Botrychium lunaria* occurs on the north side and the *Botrychium lanceolatum*, not otherwise known to occur on the Pacific Coast according to Piper, was collected by O. D. Allen at Longmire Springs.

CHAPTER IX

The Forests of Mount Rainier National Park

General Statement[1]

The remarkable development of the forests about the base of Mount Rainier results from climatic conditions peculiarly favorable to tree growth. The winters are mild and short. The ocean winds that pass through the gaps of the Coast Range are laden with moisture which falls in the form of rain or snow on the west slope of the Cascades. The trees are nourished by this moisture through a long season of annual growth, and form an evergreen forest which is, in some respects, the most remarkable in the world. This forest, distinguished by the extraordinary size and beauty of the trees and by the density of the stand, extends into the deep valleys of the rivers which have their sources in the glaciers. On the dividing ridges and in the upper stream basins the composition and character of the forest change with the increasing severity of the climate.

The distribution of the different species of trees according to the intervals of altitude at which they occur separate the forests of the Mount Rainier Na-

[1] The General Statement and considerable of the material of Chapter IX is by G. F. Allen. For some time Mr. Allen was Superintendent of the Mount Rainier National Park and later for many years he was Supervisor of the Rainier National Forest which surrounds the Park. The general statement which heads the chapter was published originally by the Department of the Interior.

tional Park into different types. The lines of separation are to some extent also determined by complex conditions of slope, exposure, and moisture. The successive forest belts are uniform in the composition of their central areas, but blend and overlap where they come together.

The low valleys of the main and west forks of White River, of the Carbon, the Mowich, the Nisqually, and the Ohanapecosh are covered with a dense and somber forest of fir, hemlock, and cedar. The trees, pushing upward for light, are very tall and free from limbs for more than half their height. Their tops form a continuous cover which the sunshine rarely penetrates, and on which the light snows of early winter fall and melt, without reaching the ground. Even in midsummer the light is soft and shaded, and the air cool and humid. In the wintertime the young growth is sheltered from wind and the severity of the cold is tempered by the protecting mountain ranges. Saved from fire by the uniform dampness of the air the trees grow until they decay and fall from old age. They are succeeded by the suppressed younger trees. The forest remains mature, not uniformly sound and vigorous, yet not decreasing as a whole in size and volume. Individuals perish, but the character of the forest is constant. The deep alluvial soil covered with moss and decayed vegetation nourishes a luxuriant tangled undergrowth of vine maple, willow, and devil's-club. The forest floor is covered with a deep layer of decayed vegetation and is encumbered with fallen and mossy logs and upturned stumps. The explorer who leaves the trails must be a strong and active man if he can carry his pack 6 or 8 miles in a long summer day.

Ascending from the river bottoms to the lower slopes of the dividing ridges the forest becomes more open

and the trees are smaller. Salal, Oregon grape, and huckleberry bushes take the place of the taller undergrowth of the valleys. Up to 3,000 feet the Douglas fir and the hemlock still are the dominant species. Above this altitude new species are found intermingled with the trees typical of the lowland, but forming a distinct forest type. The noble and silver fir appear, sometimes growing in pure stands, but more often associated with the Douglas fir and western hemlock at the lower limits of the type, and with alpine fir and mountain hemlock at the upper limit.

Nearly all the trees of this type have deep and wide-spreading roots which serve to hold in place the surface deposit of volcanic pumice which covers the slopes of the mountain. Evidence afforded by the after effects of forest fires in other parts of the Cascades indicates that the destruction of the forest on the mountainsides is followed by erosion. Heavy rains and the melting of the upper snow banks by warm Chinook winds combine to produce a surface run-off that denudes the steeper declivities down to the underlying bedrock.

At elevations above 4,500 feet the lowland trees have disappeared entirely. Sub-alpine species adapted to withstand the burden of deep snow take their place. Mountain hemlock, alpine fir, and Engelmann spruce grow singly and in scattered groups or form open groves alternating with grassy parks and rocky ridges. The symmetrical outline of the slender pyramidal crowns and rapidly tapering trunks of the spruce and alpine fir trees that stand singly on the greensward of the open parks bring to mind the closely trimmed cultivated evergreens that adorn city parks and lawns. Their lower branches reach the ground and the tops terminate in slender upright spires.

As timberline is approached tree growth is confined to dwarfed and flattened mountain hemlocks, alpine firs, and the white-bark pines firmly rooted among the crevices of the rocks.

The extreme limit of tree growth on Mount Rainier is 7,600 feet above sea level. There is no well-defined timberline. Scattered clumps of low stunted trees occur up to 7,000 feet. A few very small and flattened mountain hemlocks grow above this elevation. A very large part of the area above 4,500 feet consists of glaciers, talus slopes, barren rocky peaks, and open parks. Basins at the heads of canyons in the high mountains are usually treeless, on account of the great depth of snow which accumulates in them during the winter. On the steep, smooth upper inclines the snow banks frequently slip and form slides which acquire momentum as they rush down the mountainside and break and carry away large trees. Repeated snow-slides in the same place keep the slopes nonforested, and their track is marked by light green strips of brush and herbage.

The transition of the forest from its lowland to its extreme alpine type is one of the most interesting features of a visit to the mountain. Entering the Park at the western boundary close to the Nisqually River the road skirts the base of the lightly timbered spurs and passes into a forest of large and old Douglas fir and western hemlock. Red cedars grow along the streams that cross the road. Little yew trees and vine maples mingle with the young conifers that form the undergrowth; the gloom of the forest is occasionally relieved by the white bark of alders and the smooth gray stems of the cottonwoods that grow on the sandy bank of the Nisqually. After the road crosses the Tahoma Creek, noble fir and silver fir appear, but the

(Copyrighted by Ranapar Studio)

The Castle (left) and Pinnacle Peak (right), Rugged Crags of the Tatoosh Range as Reflected in Paradise Lake

The tall spirelike alpine firs are typical of the high mountain meadows

Douglas fir and western hemlock are still the prevailing species.

Above Longmire Springs the noble and silver fir, mixed with western hemlock, become the dominant type. The trees are shorter and the branches heavier. Mountain ash and Alaska cedar grow on the margin of the mountain streams. Huckleberry bushes take the place of the taller undergrowth of the valley.

Above Narada Falls the forest is more open, and the trees are still smaller. Mountain hemlock and alpine fir succeed the trees of the lower slope. Little glades and mountain meadows are seen. They become larger and more numerous and the traveler soon enters the open park of Paradise Valley, in which are but scattered groves of trees. The same successive altitudinal types are met in ascending to Moraine and Grand Parks by way of the Carbon Valley, and in following the Mowich watershed, Mowich Lake, and Spray Park routes.

Approaching the Park from the east the routes pass through open western yellow pine forests and western larch stands. Since Mount Rainier is west of and apart from the summit line, these species which are peculiar to the eastern slope are not found within the limits of the Park.

Effects of Fire

Notwithstanding the shortness of the summer season at high altitudes, the sub-alpine forests in some parts of the Park have suffered severely from fire. The bare white trunks of fire-killed silver and alpine firs bear witness to numerous fires which occurred from time to time before the regulations governing the Park went into effect. The little resin pockets in the bark of these trees blaze fiercely for a short time and the

heat separates the bark from the trunk. In this way the tree is killed, although the naked trunk is left untouched by fire. The destruction of the alpine forest in this way is often erroneously attributed to disease or to the depredations of insects.

There has been little apparent change in the alpine burns within the last 30 years. Reforestation at high altitudes is extremely slow. The seed production is rather scanty and the ground conditions are not favorable for germination. It will take more than one century for nature to replace the beautiful groves which have been destroyed by the carelessness of the first visitors to the mountain.

At low elevations the forest recovers more rapidly from the effects of fire. Between the sub-alpine areas and the river valleys there are several large ancient burns which are partly reforested. The most extensive of these traces is the Muddy Fork burn. It is crossed by the Stevens Canyon Trail from Reflection Lakes to the Ohanapecosh Hot Springs. This burn includes an area of 20 square miles in the Park and extends north nearly to the glaciers and south for several miles beyond the Park boundary nearly to the main Cowlitz River. The open sunlit spaces and wide outlooks afforded by reforested traces of this character present a strong contrast to the deep shades and dim vistas of the primitive forest. On the whole they have a cheerful and pleasing appearance, very different from the sad, desolate aspect of the alpine burns which less kindly conditions of climate and exposure have kept from reforestation.

The original forest was fire-killed many years before the coming of the white man. A few naked and weatherbeaten stubs are still standing. Only the larger of the fallen trunks remain, and these are rotten

(Photograph by Kanaga Studio)

The Storm Swept Sentinel

An ancient black hemlock on Timberline Ridge bent by the prevailing westerly wind. Below it are some small Alpine firs

except for a few seasoned and weatherworn shells. The second growth is of all ages, from seedlings to trees 12 to 14 inches in diameter. Vine maple, willow, and mountain ash have sprung up along the streams, and the hillsides are covered with huckleberry bushes and a variety of grasses and flowering plants.

Similar old burns are found on the ridge between Huckleberry Creek and White River, in the northeastern part of the Park, and on the ridge between Tahoma Creek and Kautz Creek below Indian Henry's Hunting Ground.

The old burns in the middle altitudes of the Park occupy regions once frequented by the Klickitat Indians. Every summer parties of hunters and berry pickers from the sagebrush plains crossed the Cascades with their horses. They followed the high divides and open summits of the secondary ridges until they came around to the open parks about Mount Rainier where they turned their horses out to graze and made their summer camp. The women picked huckleberries and the men hunted deer and goats. They made great fires to dry their berries and kindled smudges to protect their horses from flies. It was also their custom to systematically set out fires as they returned. Burning made the country better for the Indians. The fires kept down the brush and made it more accessible. Deer could be more easily seen and tracked and the huckleberry patches spread more widely over the hills.

No considerable part of the lower forests of the Park has been burned. The principal danger is from lightning. However, few of the trees struck are ignited and these fires are usually extinguished by the rain. On account of the coolness of the air and its greater humidity the fire danger in the forests on the lower

slopes of Mount Rainier seems much less than it is in corresponding situations in the main range of the Cascades.

Age and Dimensions of Trees

Trees grow more rapidly at low altitudes than at higher and cooler elevations. Under similar conditions some species increase in size faster than others, but the rate of growth depends principally upon environment. The average increase at the stump in valley land is about 1 inch in 6 years. A Douglas fir growing along the road between the park boundary and Longmire Springs, at the age of 90 to 120 years, may have a breast diameter of 20 inches and would yield 700 feet of saw timber. But many of the trees of this size may be much older on account of having grown in the shade or under other adverse conditions. The trees between 200 and 300 years of age are often 40 to 50 inches in diameter and would yield an average of from 2,700 to 5,500 board feet. The largest Douglas firs are sometimes over 600 years old and 60 to 100 inches in diameter. Such trees when sound would produce over 8,000 feet of lumber.

The western red cedar has a shorter and more tapering trunk and its volume in board feet is proportionally smaller. A tree 50 inches in diameter and 175 feet high contains about 3,400 board feet.

The size of the trees decreases rapidly at higher elevations. In the sub-alpine forest the annual growth is very small. At elevations of 6,000 feet the white-bark pine requires 200 years to attain a diameter of 10 or 12 inches. The annual rings are so close together that they cannot be distinguished without a magnifying glass.

Natural Rotation of Species

In virgin forests such as those found within the boundaries of the National Park a decidedly interesting natural rotation is constantly taking place. Each species of tree has a normal old-age limit beyond which it becomes decadent, does not add growth rapidly, and is particularly subject to disease or insect attack. Very soon thereafter it is apt to be windthrown and the younger, more vigorous trees of the understory will quickly take its place. This age limit, though it varies somewhat with varying conditions of climate and site, is for each species of tree fairly definite.

With Douglas firs, growing at their optimum, this is between 600 and 700 years, while with western hemlock 400 years is an average. The western red cedar often lives upwards of 1000 years but between 700 and 800 years is its normal limit. Some of the broadleaf species such as the cottonwood become old and decadent at 100 years or less, while the giant sequoia, oldest of living things on earth today, may attain to the ripe old age of 4,000 years.

The finest example of this natural rotation takes place between the Douglas fir and the western hemlock, the two dominant species of the lower forests. Douglas fir seedlings are very intolerant of shade and require open areas with plenty of sunshine in order to thrive. Hemlock on the other hand is decidedly tolerant and prefers dense shade. Where almost pure stands of Douglas fir have established themselves following fires the forest floor is so densely shaded that no Douglas fir seedlings will grow, consequently the lower story is composed largely of the shade-loving hemlock seedlings. On moss-covered dead logs in the dense forests these seedlings grow in masses—as many

as 2000 sometimes growing on a favorable square foot of area.

As soon as an old veteran fir falls out, its place is taken by the hemlock seedlings, already well developed, which grow rapidly toward the break in the crown canopy.

It is readily seen that when the stands of fir are even aged, as they usually are following fires, that they reach their old-age limit at about the same time, and within a few decades a giant forest of fir may be almost entirely superseded by a stand of young hemlock.

Examples of this change may be found all over the lower zones of the Park. In dense stands composed largely of hemlock it is found that the old stumps and large windfalls are almost without exception Douglas fir although there may not be a living fir tree in sight.

A splendid example of this change in the process of taking place is found just back of the meadow at Longmire Springs. Here, on the lower slope of Rampart Ridge, there is evidence that some 650 years ago the slope was burned over following which a dense stand of Douglas fir developed. A view of the stand from the road reveals the fact that at present the stand is composed largely of western hemlock and balsam, both shade-loving trees, most of which are under 100 years of age. Here and there standing head and shoulders above the even-aged present stand are great stag-headed Douglas firs 5 feet in diameter and 250 feet high.

From the Trail of the Shadows it is noticed that everywhere on the ground there are great fir stumps and windfalls already covered by feathery hemlock seedlings. Within a few years those remaining patriarchs will fall and the stand will remain hemlock

Douglas Fir

A Typical Tree of the Park

Alaska Yellow Cedar

A Typical Tree of the Park

until it becomes old and decadent or until fire or disease sweeps it clean, giving the Douglas fir another opportunity. Splendid examples of the way in which Douglar fir establishes itself following a burn or cutting may be found in the Muddy Fork burn or the Bear Prairie burn where there are dense stands of vigorous young firs.

Commercially the fir is much the more valuable species. This accounts for the clean cutting methods used in logging throughout the Northwest. Where the area is cut clean and the slash burned, natural reproduction soon establishes a fir forest, while if the small trees were left standing to shade the ground and the slash left unburned an inferior forest of hemlock and balsam would result.

DESCRIPTION OF SPECIES

Names: Douglas Fir (*Pseudotsuga taxifolia*)

General Description: A large tree growing normally up to 6 feet in diameter and 250 feet high. Bark of mature trees, reddish with heavy ridges. Half or more of the trunk of forest-grown trees is free of branches. Crown not dense. Needles flattened, about an inch in length and grow on all sides of twig. The cones are reddish, about 3 inches in length and one inch in diameter; cone scales flexible with protruding bracts. Cones grow well distributed over tree and are pendant. Seeds, small and winged. Sapwood, reddish, strong, fairly even grained and the best wood for general construction purposes found in the Northwest.

Identification: The bark of the Douglas Fir is deeper grooved than that of any other tree in the Park; the cone is the only pendant cone with protruding bracts

and no other flat needles are found growing in whirls on the twigs.

Occurrence: Douglas Fir is the dominant forest tree of the region from sea level to an elevation of about 3,500 feet, occurring at times in almost pure stands but more often mixed with Red Cedar, Western Hemlock, and other species. Prefers warm exposures and well drained soil. Splendid examples are found along any of the approach roads or on any of the lower trails.

Remarks: During the gold booms of 1849 and 1850 it was found easier to send ships north to Puget Sound for needed lumber, spars, masts, and mine timbers, where the dense forests grow down to sea level, than it was to go into the mountains of California to secure them. It was thus that Douglas Fir first became known commercially. At present it is the most valuable timber tree in America not only for the quality of the wood but also because of its abundance. It is used for nearly all purposes where durability, strength, and hardness are desirable. It is made into dimension timbers, lumber, finish material, veneer, and is, because of its straightness and even taper, particularly adapted for spars, masts, telephone poles, and piling.

The little Douglas squirrel depends largely upon the Douglas Fir for his food and during the fall gathers and stores large quantities of the cones for winter use.

Names: Western Red Cedar, Canoe Cedar, Shingle Cedar (*Thuja plicata*)

General Description: A large tree with arbor-vitæ-like foliage, thin fibrous bark, gray or reddish in color and fairly smooth, and small six to nine scaled cones which grow late in the summer in great masses near

the tips of the twigs. The trunks swell at the butt. The wood is reddish and has a characteristic aromatic odor. It is an exceedingly durable wood. Trees known to have lain on the ground for over 300 years have been found to be perfectly sound.

Identification: There are two so-called cedars occurring in the Park, the Western Red Cedar and the Alaska Yellow Cedar. The Red Cedar grows in the lower valleys, has darker, softer bark and the foliage is coarser in texture, denser, and darker in color. The cone of the Red Cedar is a flat-scaled cone while that of the Yellow Cedar is roundish with mushroom shaped scales.

Occurrence: Grows in mixed stands from the boundaries to 4,000 feet altitude, preferring the wet river bottoms and other marshy areas. Good examples may be found along any of the approach roads below 3,000 feet elevation. Some of the finest specimens in the Park are found in the vicinity of the Ohanapecosh Ranger Station.

Remarks: The Western Red Cedar ranges from southeastern Alaska to northern California. It is a common tree in the Park. The bark is fibrous in appearance and may be readily separated into long strips. The leaves are fragrant and the wood has a pleasing aromatic odor. Nearly all the large trees are hollow at the butt. The roots spread laterally to a great distance, but extend only for a short distance below the surface of the ground. The tree is easily overthrown by the wind and usually grows in sheltered localities. On account of the thinness of the bark it is easily killed by fire.

The Red Cedar flourishes on fertile and well-watered soils near sea level, where it grows to an enormous size. In the Park it is a smaller tree, 150 to 170 feet high and rarely more than 4 or 5 feet through above

the swollen butt. It grows occasionally up to an altitude of 4,000 feet, but is a small and insignificant tree in the high mountains.

In the sapling stage the Red Cedar grows rapidly. The mature tree increases very slowly in size. It exceeds all other trees in the Cascades in longevity. Individuals more than 500 years old are not uncommon and there is a well-authenticated instance where the annual rings indicated a growth of more than 1,100 years.

While the Red Cedar forms no great proportion of the forest of the Pacific Northwest, it is peculiarly valuable to the pioneer on account of the durability of the wood and the ease with which it can be split into boards, shakes, and planking. The early settlers used cedar, split by hand, as a substitute for sawn lumber in flooring and finishing their cabins and for the tables and shelves with which they were furnished. The Indians hollowed the great trunks with fire and made them into canoes, some of which were large and seaworthy enough to be used on the Sound and in making voyages along the coast. They wove the fibrous roots into baskets that carried water and plaited the bark into matting. The wood of the Red Cedar is reddish brown in color. It is soft, light, and very brittle, but very durable. It is extensively used for shingles, the manufacture of which forms one of the important industries of the State of Washington.

Names: Western Hemlock (*Tsuga heterophylla*)

General Description: A large tree, straight boled and tall. The bark is fairly smooth, hard and quite dark. The twigs are feathery in appearance, the needles being only about a half inch in length and arranged in two opposite rows in the same plane.

(Photograph by Asahel Curtis)

Giant Firs and Hemlocks Along the Nisqually Road

The cones are about an inch in length and three-eighths of an inch in diameter. They are smooth, dark brown when mature, and fairly firm.

Identification: The thin, dark, and fairly smooth bark, short needles, flattened twigs, and small cones are all marks of the Western Hemlock. It may be known from the Mountain Hemlock by the cones which are only about half as large and the less matted appearance of the needles. The only other tree which has similar needles is the Western Yew, a small tree the bark of which is red and scaly.

Occurrence: Next to the Douglas Fir the Western Hemlock is the most abundant tree in the Park. It commonly occurs mixed with other species but often in dark valleys occurs in almost pure stands. The trees grow at their optimum in the low valleys but are often found as high as 5,000 feet on Mount Rainier. Splendid specimens are common all along the lower roads and trails.

Remarks: Western Hemlock is a shade-loving species often found as an understory below stands of Douglas Fir and Cedar. The Hemlock produces abundant seed each year, although it, like most trees, is particularly prolific at irregular intervals. The seeds germinate readily on decayed moss and rotten wood as well as upon the mineral soil. Seedlings frequently grow on fallen logs and extend their vigorous roots around the sides until they reach the ground and become firmly anchored in it.

Although not as long lived as the Douglas Fir and the Cedar, trees sometimes attain an age of 500 years. Such trees are usually hollow at the center as the wood is very susceptible to decay. The tree is easily fire-killed because of the thin bark. The wood is tough, light, and straight grained but not durable where

exposed to the weather. On the market the lumber is much more valuable than that of the Eastern Hemlock but it has suffered from the reputation of the Eastern variety. Where cut commercially the tree is sawn into dimension stuff or rough lumber used for temporary construction.

Names: WESTERN WHITE PINE (*Pinus monticola*)

General Description: A tall straight-boled tree with smooth light-colored bark broken into small squares checkerboard fashion. The needles grow in bundles of five each, forming soft flexible tufts about 3 inches long. The cones are light brown in color, 6 to 10 inches long and about 2 inches in diameter. The wood is white, soft, even grained, and is ideal for mill work, fine boxes, match stems, foundry patterns, and other work where a soft, even-grained wood is required.

Identification: This is the only pine found in any abundance in the Park. It may be readily identified by the slim, soft needles growing five in a bundle, the light-colored checked bark and the long, slim cones.

Occurrence: Western White Pine while not abundant in any one locality is well distributed throughout the Park to an elevation of 4,000 feet. It usually occurs in scattered stands mixed in with Douglas Fir, Western Hemlock, and the true firs, preferring level benches and gentle slope, where the exposure is good and the soil deep. Fine specimens are common along the Nisqually road between Longmire Springs and the glacier and along the upper reaches of the White River and Carbon River roads.

Remarks: The Western White Pine never grows in

pure stands. It reaches its best development on southern slopes at elevations ranging from 3,000 to 3,500 feet, where it reaches a height of upwards of 200 feet and a diameter of 40 or more inches. The shaft is straight, cylindrical, with a uniform taper and clear of limbs. It bears a small, narrow crown of drooping branches. In open areas, where it is exposed to an abundance of sunlight, its mode of growth is wholly different. The trunk is short, rapidly tapering, and bears wide, spreading branches nearly to the ground. The same is true of the Douglas Fir as evidenced by those found on the parklike gravelly prairies south of Tacoma.

Although the Western White Pine is not a common tree in the Park it is often noticed on account of the abundance of long, pendant cones. They mature every two years and shed their seed early in September. The seeds are provided with long wings and are often carried by the wind for a great distance from the parent tree.

Names: AMABILIS FIR, SILVER FIR, LOVELY FIR (*Abies amabilis*)

General Description: A beautiful tree, straight and clean boled with fairly smooth thin bark and a rounded crown of brilliant deep-green needles about one inch long, flattened and lighter on the under side which accounts for the name Silver Fir. This is one of four true firs or balsams (the Douglas Fir is not a true fir belonging to the genus *Abies*) occurring in the Park. The bark of young trees is unbroken, of a grayish color, and contains numerous pitch blisters. The cones stand upright on the branches, are about four inches long and dark purple in color. The wood

is straw-colored, compact and straight-grained, but not durable nor valuable commercially.

Identification: The true firs or balsams may be known by the upright cones that are formed each year near the top of the trees. The cones of the balsams never fall from the tree but disintegrate upon the tree, freeing the winged seeds and leaving the cone core standing on the tree. The Amabilis Fir is known by its purple cones, 2½ to 3½ inches in length. The needles usually spread horizontally with a few rows of needles on top of the twig lying with their ends toward the tip of the twig. It is very closely related to the Alpine Fir but is sub-alpine rather than alpine in its range.

Occurrence: Amabilis Fir is very abundant in the Park, occurring on level bench lands, and gentle slopes with northern exposures from 2,000 to 5,000 feet elevation. It seldom grows in pure stands but is associated with the Douglas Fir, Western Hemlock, and Noble Fir. Typical trees may be found in the vicinity of Longmire Springs.

Remarks: In dense stands the stems of the Amabilis Fir are free from branches for 50 to 100 feet and the tree grows to be 3 to 5 feet in diameter and 150 to 180 feet high. At altitudes over 4,000 feet small Silver Firs often occur in clusters and open groves. Under such conditions the trunk is covered with branches which grow to the ground, turning downward and outward in long graceful curves, admirably adapted to withstand the pressure of the heavy snows. The Silver Fir is often grown in the East and in Europe as an ornamental tree but under cultivation it loses much of the natural grace and beauty which it acquires in adapting itself to the deep snows and long winters of its native environment.

Names: NOBLE FIR (*Abies nobilis*)

General Description: A large tree with light bark and long straight boles. The crown is rounded and the foliage is a dark bluish green quite noticeable in mixed stands where the leaves of its associates are a purer green. The twigs are short, thick, and crowded with stiff, flattened leaves, which turn upward and outward. The cones are very large, sometimes 6 inches long and 3 inches thick, a light green in color and covered with protruding bracts of a lighter color. They grow upright near the tip of the tree, are formed each year, and ripen early in September although the scales do not fall until later. The Noble Fir is a slow-growing, long-lived tree and the wood is strong, close grained, and elastic, of a light color.

Identification: Old trees in mixed forests are easily distinguished from the associated species by the ashy-brown outer bark broken into large irregular plates, by the upward curved, densely growing needles, and the large bract-covered cones growing upright at the top.

Occurrence: A typical mountain tree of the Cascades occurring abundantly in the Park between elevations of 3,500 and 5,000 feet. Sometimes grows in almost pure stands such as that just below the glacier on the Nisqually road, but more often associated with Silver Fir and Western Hemlock. Splendid examples may be found at the elevation of the terminus of any of the primary glaciers.

Names: ALPINE FIR, SUB-ALPINE FIR (*Abies lasiocarpa*)

General Description: A tall spirelike tree of the high country, with dense masses of drooping branches extending to the ground. The crown is broad at the

base and tapers to the top where it terminates in a slender, pointed tip. The foliage is very dense, the branches often flattened so as to appear to be in irregular layers, and of a deep-green color. At the lower limits of its range the Alpine Fir grows to be a fair-sized tree upwards of 100 feet high. At timberline it becomes a stunted shrub with dense matted branches spreading out on the ground. These matts become so dense that they form ideal mattresses on which to spread one's bed. The needles are about one inch long, flat, and often grow in overlapping tufts giving the twig a notched appearance. The cones are 2 to 2½ inches long, pubescent, a deep-purple color, and occur in clusters at the tip of the tree. It seeds sparingly each year with seasons of heavy seed production occurring at intervals of three or four years. Clumps of these trees growing on exposed ridges are often struck by lightning. The tree fire-kills easily because of the thin balsam-filled bark and the low inflammable branches. The wood is white, soft, and splits easily. It has no commercial value.

Identification: The best field mark of the Alpine Fir is its characteristic spirelike appearance and its alpine habitat. Where Alpine Fir occurs with Amabilis Fir it is difficult to distinguish between them as in most respects they have similar features. The best mark is that the cones of the Amabilis Fir are about one inch longer than those of the Alpine Fir and are not pubescent while those of *Abies lasiocarpa* are.

Occurrence: This is preëminently the tree of the alpine meadows where it occurs in dense clumps associated only with the Mountain Hemlock. It makes up the greater bulk of the stand in the park-like areas between 5,000 feet and timberline. The only other tree occurring with it in many regions, such

as Paradise Valley and Indian Henry's Hunting Ground, is the Black or Mountain Hemlock. The Alpine Fir is a typical Alpine tree, and with its short drooping branches extending to the ground is well adapted to exist in a region where the snow often lies 20 feet deep on the ground and the entire tree is encased in ice or frozen snow for months at a time.

Names: LOWLAND WHITE FIR, SILVER FIR (*Abies grandis*)

General Description: The Lowland White Fir, like several others of the true firs, is usually given the name of either White Fir or Larch by old mountaineers. Very little Larch, however, occurs west of the Cascade Range. With the Douglas Fir, Hemlock, and Red Cedar, it forms the dense forests characteristic of the lower valleys of the Park. Under favorable conditions the Lowland Fir grows to a height of 100 to 200 feet, and is a noble and stately tree. The trunk is smooth and straight and bears a rounded pyramidal crown. In dense forests the trunk is clear for half its height, but where the tree stands in the open it carries its branches nearly to the ground. The leaves are a bright shining green about one to one and a half inches in length, flattened with a notch at the apex. They usually spread horizontally on the twig in two opposite rows giving the boughs a feathery appearance. The cones are fairly large, 4 to 5 inches in length, and are a light green in color. The seed ripens early in the fall. The bark of young trees is smooth and a light gray in color which gives it the common name of White Fir. The bark of the older trees becomes broken into narrow ridges, is hard, and a very dark gray color. The wood of the Lowland Fir is soft and very heavy while green, it rots

quickly when laid on the ground, and is of little value as lumber. When dry the wood is white, coarse-grained, fairly light, and odorous.

Identification: The whitish bark of young trees, the long, light green, horizontally spreading needles, with a notch at the tip, and the large light green cones are field marks of the Lowland Fir.

Occurrence: As its name indicates, the Lowland Fir is a tree of the moist lower valleys and river bottoms. It is abundant in the Park up to 3,000 feet and occurs in favorable situations as high as 4,000 feet. It is a moisture-loving tree and is usually found firmly rooted in deep alluvial soil such as that preferred by the Red Cedar. Characteristic trees may be found near any of the Park entrances.

Names: MOUNTAIN HEMLOCK, BLACK HEMLOCK (*Tsuga mertensiana*)

General Description: In its optimum, the high Alpine meadows, the Mountain Hemlock is a fair-sized tree with dark hard bark and twisted and gnarled branches extending in irregular masses almost to the ground and bearing dense matts of half-inch needles arranged in star-shaped whorls. During the summer the new needles, which are a light green in contrast to the very dark green older needles, are particularly conspicuous. The tree seeds every year. In good seed years the branches are laden with a profusion of beautiful deep-purple cones from 1½ to 2 inches in length and ½ inch in diameter. Often these develop in such abundance as to bend down the branches by their weight. Reproduction, as with all high-altitude trees, is very slow. In the high valleys the trees are often completely buried in snow from October to late

in June and consequently the growing season is comparatively short. Next to the Alpine Fir the Mountain Hemlock is the most abundant tree of the high meadows where its rugged wind-swept crown is easily distinguished from the tall spirelike Alpine Fir.

Identification: Normally the only other tree associated with the Mountain Hemlock is the Alpine Fir which is easily distinguished by its large upright cones and the needles which are twice the length of the hemlocks. The two-inch cone which is usually present and the denser matted appearance of the twigs distinguish it from its lowland relative the Western Hemlock.

Occurrence: The Black Hemlock is typically a tree of the alpine valleys. It is very abundant in the Park between an elevation of 4,000 feet and timberline. It sometimes forms dense forests under 4,500 feet, where it is often a fair-sized tree 50 to 90 feet high. With the ascent of the mountain it diminishes in height and the branches become gnarled and twisted. At timberline the trunk is dwarfed and bent at the base and the crown is often prostrated by the high winds and heavy snows which causes the flattened masses of branches to lie close to the ground. This hemlock is abundant on high, rocky ridges, but the best trees are found in cool, moist soil at the heads of ravines, on flats, and on gentle slopes with northern exposures. Typical trees may be seen in any of the high alpine meadows at about 5,500 feet elevation. In northern Alaska this tree occurs at sea level. Nowhere in its range is it used except as fuel wood.

Names: WHITE-BARK PINE (*Pinus albicaulis*)

General Description: The White-Bark Pine is a lover of the high wind-swept ridges and summits. The

trunks are seldom more than a foot in diameter and usually bend toward the east as the prevailing wind is westerly. The outer bark, from which the tree derives its name, consists of thin light gray scales. The wood is close grained and resinous; it makes excellent fuel for the campfires of mountain wanderers. The White-Bark Pine belongs to the White Pine group and in common with other members of this family has five needles in a bundle. The leaves are 2 to 3 inches in length and dark green in color. The thick purple cones require two years to mature. They ripen early in September and produce chocolate-brown seeds a little larger than a grain of corn. These are edible and are much relished by the Klickitat and Cowlitz Indians, who go to considerable pains to secure them.

The roots of the tree are deep, long, and tenacious. They spread wide and cling so firmly to the rocks that the tree is rarely overthrown by the violent gales that sweep over the mountain.

These hardy veterans of the timberline are the pioneers of the tree world who have advanced to the farthest frontiers. Here their lives are a continual struggle against the elements. Now and then one sees white masses, the bleached skeletons of those who have not been able to withstand the battle. There is romance in the life of the White-Bark Pine.

Identification: No other tree can be mistaken for this Alpine White Pine with its tufts of needles in bundles of five, its heavy deformed cones and light colored bark.

Occurrence: The White-Bark Pine is a timberline tree wherever found. It is the most alpine of all the pines and only the Trailing Junipers go higher upon the rocky ridges that break the monotony of snow and ice. Its lowest limit on Mount Rainier is above 5,000

feet elevation. In sheltered places where the soil is deep the trees are sometimes 30 to 40 feet high and 20 inches in diameter, in which case some 8 or 10 feet of the trunk may be free from branches.

As the White-Bark Pine advances up the mountain its habit changes rapidly. The stem shortens and becomes gnarled and twisted. The tough, flexible branches reach the ground and spread over it to a great distance from the tree. On rocky summits and the bleak crest of wind-swept ridges the twisted trunk and branches are quite prostrate and the crown is a dense flattened mass of foliage. Trees growing in typical situations may be found near the summit of Pinnacle Peak, the top of Sluiskin Falls, and other similar places. The White-Bark Pine, and also the Sitka Spruce, is far more abundant on the east and north sides than on the south or west sides.

Names: Lodgepole Pine (*Pinus contorta*)

General Description: The Lodgepole Pine varies a great deal in appearance in different parts of the country. It has a broad range and adapts itself easily to the different conditions of soil, moisture, and exposure. In the Rocky Mountains it often grows in dense thickets where the trunks are small and slim, forming ideal poles for the conical teepees of the plains Indians. Hence the common name Lodgepole Pine. In Mount Rainier National Park it is not abundant and is of an entirely different type. It does not often exceed 20 to 40 feet in height and is usually a much smaller tree. The short heavily limbed trunk bears little resemblance to the slender eastern type. *Pinus contorta* is one of the black pine group with a yellowish-green foliage of 2-inch needles, 2 in a bundle. At

high elevations the leaves have a peculiar whorled appearance which gives it a different aspect from that of the other pines.

The cones are small and lop-sided which gives rise to the species name *contorta*. They hang down in ones and twos from the under sides of the larger twigs and are produced in abundance.

Occurrence: Lodgepole Pine occurs only sparingly in the Park from the boundaries to an elevation of 5,000 feet. It prefers the warmer, dry ridges on the east and north sides and is quite rare on the south and west sides. Typical specimens may be found near the Soda Springs at Longmire or on the Cowlitz divide.

Names: Alaska Yellow Cedar (*Chamæcyparis nootkatensis*)

General Description: The Alaska Yellow Cedar is not a true cedar, none of the genus *Cedrus* being native to America, but rather belongs to the arbor vitæs or trees with flattened scalelike leaves. The same is true of the Western Red Cedar. The foliage of the Yellow Cedar is yellowish green, the twigs are inclined to be pendant and sparse growing. It resembles the Red Cedar, but the leaves are sharper and smaller and rougher to the touch. The bark of the young trees is red but as the tree grows older it becomes a light gray and fibrous although not as soft as the Red Cedar. In favorable situations the Yellow Cedar grows to be 80 feet high and 3 feet at the base with 20 to 30 feet of clear straight stem. The wood, because of its slow growth, is fine grained and fairly hard. It is aromatic, of a yellowish color, and takes a high polish. The lobby furniture of Paradise Inn is made from Alaska Cedar and the rustic framework is of logs from the

Silver Forest which was almost a pure stand of Yellow Cedar before it was fire-killed some 40 years ago. The bark was scorched by a light ground fire which killed the trees but did not burn them. Through almost half a century of sunshine and storm the naked trunks have weathered to that pure silver-gray color. The wood is very durable; many trees that have lain on the ground for years are entirely sound.

The cones are almost round with from 6 to 9 mushroom-shaped scales. They are produced somewhat sparingly.

Identification: The only other arbor-vitæ-like tree occurring in the Park is the common Red Cedar. The Yellow Cedar may be known by its harder, lighter bark, sparser, more pendant foliage, yellow rather than reddish wood, and rounded rather than flat-scaled cone.

Occurrence: The Alaska Cedar derives its species name from Nootka Sound, Alaska, where it grows at sea level. Within the Park it occurs from about 2,500 to 6,000 feet elevation. It is common on northern exposures, along streams, and in basins at the head of canyons. It also grows on crests and ridges, where frequent showers and fogs supply the moisture it demands. Under such conditions it is dwarfed and scrubby. Splendid specimens may be found in the vicinity of Narada Falls.

Names: Sitka Spruce (*Picea sitchensis*)

General Description: The Sitka Spruce is a tideland tree which grows in great forests on the west side of the Olympic Peninsula. Here the straight round trunks stand close together and attain a height of 200 feet and a girth of 8 or more feet. Within the Park it is quite

a different tree. The needles grow in whorls about the twigs, are about one inch in length, stiff and sharp pointed. In its sub-alpine range the trees seldom become more than 3 feet in diameter and 100 feet high. Usually the branches extend almost to the ground. The cones are straw colored when ripe, about 3 inches in length, and made up of many thin flexible scales. The sapwood is white. The heartwood has a slight reddish tinge. It is stiff, straight grained, very light, and moderately strong. The Sitka Spruce came into prominence during the war as the best material for aeroplane stock.

Identification: The spruces may be known by the stiff, pointed needles, that feel prickly to the touch, the soft, thin-scaled cones, and the dark scaly bark. There are no other members of the genus in the Park.

Occurrence: The Sitka Spruce is most common and reaches its greatest development not far from the ocean beach, but extends up the valleys and fair-sized trees are scattered through the river bottoms of the Carbon and White Rivers in the Park. Small trees, stunted by the cold and bearing little resemblance to the big spruce characteristic of the forests of the fog belt, are found on the ridges between the Winthrop and Carbon Glaciers at an altitude of 6,000 feet. About Summerland it is plentiful. In the Nisqually Valley a few isolated trees grow and on Rampart Ridge, near Longmire Springs, at an elevation of 4,900 feet, a solitary individual stands surrounded by sub-alpine trees.

Names: WESTERN YEW, OREGON YEW (*Taxus brevifolia*)

General Description: The Western Yew as it occurs in the Park is a small tree rarely over 20 feet in height.

The bark is red, reddish brown, and purple. It is shed in thin flakes giving the trunk a mottled appearance. The heartwood is dark reddish brown, very tough and heavy. It takes a fine polish and was used by the Indians for spear handles, bows, and fishhooks. Most of the English long-bows used in modern archery are made from this Yew as Robin Hood's bows were made from the English Yew. The crown is irregularly rounded, sparsely branched, and ragged in appearance. The twigs carry two rows of horizontally flattened needles about half an inch long. The fruit is a small, bright, amber-red berry.

Identification: The reddish, flaky bark, and red berry-like fruit are sufficient to identify the Yew.

Occurrence: Western Yew occurs in the Park up to 4,000 feet, growing in rich gravelly soil on moist flats and benches and in deep ravines. Splendid specimens may be found in the Public Automobile Camp at Longmire Springs.

Deciduous Trees

The silva of Mount Rainier National Park and the Western Cascades is rich in evergreens remarkable for their size and beauty. The deciduous trees are few in number and insignificant as compared to the conifers. Vine Maple and Willow are found as undergrowth. On the margins of rivers there are occasional groves of Alder and Cottonwood. The lighter hues of the branching trunks and the changing tints of the foliage in these patches of broad-leaved trees present a pleasing diversity to the evergreen forest. In the autumn the Vine Maple and Cottonwood produce brilliant red and yellow trimmings for the dark green mantle of coniferous trees.

Names: Broadleaf Maple (*Acer macrophyllum*)

General Description: This is the largest of the Pacific Coast Maples. It sometimes attains a height of 40 to 50 feet and a diameter of 2 feet. The crown is rounded and the leaves are very large averaging 6 inches across. The bark is hard, dark gray in color, broken into narrow ridges and often covered with moss. The seeds are winged in much the same way as the other maples.

Identification: The broad maple-like leaves of this tree are sufficient to identify it.

Occurrence: Thrives in moist areas near streams in the low valleys below 3,000 feet. Specimens may be found just within any of the entrances to the Park.

Names: Vine Maple (*Acer circinatum*)

General Description: In the Park the Vine Maple is usually a bush or shrub with stems 15 to 20 feet long but usually bent and curiously crooked. The bark is smooth, greenish, and thin. The leaves similar to those of the Sugar Maple about 3 inches in breadth. The wood is tough and elastic and makes a hot and lasting fire. The limbs often carry great masses of moss.

Identification: The maple-like leaves and vine-like growth are sufficient to distinguish the Vine Maple.

Occurrence: This peculiar Maple is abundant in rich river bottoms and along streams below 3,000 feet elevation. It occasionally occurs as high as 4,000 feet. Specimens may be noted along any of the lower roads or trails. In September and October it is quite conspicuous because of its brilliant coloring.

Names: Red Alder, Oregon Alder (*Alnus oregona*)

General Description: The Red Alder is the most abundant of all the deciduous trees in the Park. Under favorable conditions it grows to be 40 to 50 feet high and 18 inches in diameter. The bark is smooth and varies from almost white to light gray. The trunks are usually straight and free of branches for 20 feet or more. The crown is irregular and the leaves are oblong with serrate edges. The fruit is a small cone-like burr about half an inch in length. The wood is hard, reddish, and used extensively in the manufacture of cheaper grades of furniture.

Identification: The elm-shaped leaves, whitish bark, and cone-like burrs are field marks of the Red Alder.

Occurrence: The Red Alder is common in the Park up to 4,000 feet, being quite abundant along the lower streams where it sometimes occurs in dense, pure stands, and on rock slides near the upper limits of its range often forms dense tangled thickets. Specimens may be noted along any of the approach roads.

Names: Black Cottonwood (*Populus trichocarpa*)

General Description: The Black Cottonwood is the largest broad-leafed tree occurring in the Park. Specimens become 100 feet in height with straight unbranched stems 3 feet in diameter at the base. The leaves are heart-shaped to oval about 4 inches in length with finely serrated edges. They are almost always in motion, very gentle winds being sufficient to make them twinkle and turn. The bark is dark gray and broken into low ridges. The wood is white and soft but tough and compact and does not split readily.

Identification: The smooth heart-shaped or oval leaves and long sticky buds, brown in color and sharp pointed, are marks of the Cottonwood.

Occurrence: Occurs as high as 4,000 feet along streams. Quite common below 3,000 feet in all the river valleys. Splendid specimens may be found along the bars of any of the larger streams.

Two other shrubs occur in the Park that attain the rank of trees under more favorable conditions. These are the Alpine Willow and the Mountain Ash.

Several species of dwarfed Willows (*Salix*) are found usually along streams and in marshy areas up to and somewhat above timberline. These are all broad-leaved varieties similar to those that grow on the great tundra barrens beyond the Arctic Circle.

The Mountain Ash, *Sorbus occidentalis*, is abundant in open areas, on talus slopes and rock slides up to 7,000 feet elevation. It seldom grows more than 6 to 10 feet in height and at this elevation is a shrub rather than a tree. It has large clusters of rather small white flowers and finely divided compound leaves. Late in the summer it attracts a great deal of attention by its large flat bunches of bright red berries which are also admired and relished by the bears, squirrels, and many of the birds.

CHAPTER X

Animals of the Park [1]

All the National Parks are wild-life sanctuaries as well as being Scenic and Forest reserves. No hunting or trapping is allowed, except that predatory animals such as cougar, coyote, and bobcat are hunted at times by the Rangers, not with the idea of exterminating them, but in order to keep them under control for the protection of other Park animals.

The varied wild-life of the Park constitutes one of its chief attractions and every effort is made to protect and encourage it. It is doubtful if the memory of mountains, glaciers, or wild flower fields remain longer with the average visitors than the sight of deer or elk grazing on distant slopes or the chance encounter with bears on the forest trails.

Small as the Park is, compared with the region of a similar nature surrounding it, practically every land form of wild animal life common to the Northwest is found within its borders. Fifty-four mammals have been listed. Of these about one-fourth would be

[1] Much of the material of Chapter X is from notes by Dr. E. W. Nelson, Chief of the United States Biological Survey, and Mr. William P. Taylor of the same bureau. It is used here by permission. Various statements have been quoted direct from Dr. Nelson's material on North American mammals as originally published in *The National Geographic Magazine*. Such are copyrighted by The National Geographic Society, and republished by special permission from "Wild Animals of North America."

classed as big-game animals. The other three-fourths are small animals, many of them rodents. These small individuals are far more numerous and consequently more often met with than the larger species.

Not only does one find a great variety of forms but among them an equal variety of habits and characteristics. As stated above the rodents or gnawing animals, such as squirrels, rats, mice, beaver and marmot, make up the bulk of the small-mammal population. Their food is largely vegetable although some of them eat insects and meat when available. Next in point of numbers come the carnivore, or flesh eaters. These include the weasel, marten, mink, bear, cougar, wild cat, and wolves, whose diet is largely meat secured by preying upon other animals.

A third class lives almost exclusively upon worms and insects. These include the moles, shrews, and bats.

Of the horned, herbivorous animals only three are found, the elk, deer, and mountain goat. The two latter animals are fairly abundant in the Park and all are frequently seen.

In the entire region there is no animal of which visitors need be afraid. Even bears or mountain lions, should they be met on the forest trails, are not dangerous, being just as shy and anxious to avoid trouble as is the Park visitor. Individual bears will occasionally raid camps while the occupants are away and buck deer and elk that have become accustomed to human beings are treacherous and dangerous to approach.

It is well to remember that even the friendliest animal if frightened or molested may be dangerous and that all the Park animals are wild and have never been domesticated in the least. If a bear or deer allows one to approach near to it and perhaps takes food from the hand it is because it is fearless rather than tame.

Most of the predatory animals are nocturnal in habits and therefore are rarely seen by Park visitors. They are known even to the Rangers largely by their tracks and the evidences of their destructiveness. Although they strike terror to the hearts of their victims they are exceedingly shy and harmless as regards man.

Very frequently it is found that ferocity and bravery increase in proportion to a decrease in size of the animal. The cougar, for instance, is one of the most cowardly of animals while some of the small rodents such as the field mice are exceedingly brave. If the common weasel should be increased to the bulk of a mountain lion and retain its nature and physical prowess, it would be many times more dangerous than any existing carnivore and the devastation it would commit would be appalling. Muskrats and even the tiny shrews, among the smallest of animals, will face their enemy and fight to the death under conditions that would put most larger animals to instant flight.

Excessive competition among animals in the endless search for food has apparently driven them to adopt many of their peculiar habits. Of the insectivorous animals we find the moles spending most of their lives underground burrowing for worms and the larvæ of insects; the shrews hunt at night, as a protection against their numerous enemies, but on the ground and in the water; while the bats search the air for the same sort of food.

As a rule wild animals are of inconspicuous colors that harmonize well with their surroundings.

Certain animals have seasonal variations of color. Two mammals and one bird found within the Park have a complete change from their normal color to a pure white winter coat. This change is due to moult-

ing, and apparently is dependent upon the season. It is noted that if the snows come early on the high ridges the ptarmigan change to their white feathers earlier than if the winter season is late in coming.

Living in the pure white snow for several months of each year it is readily seen that this protective white coat serves them well. The snowshoe rabbit adapts himself rapidly to these seasonal conditions. In the winter, when all about him is white, he is white. When the snow begins to go and there are brown spots here and there in the woods he has brown spots also, and when the snow has entirely disappeared and the floor of the forests is entirely brown he is entirely brown. The weasels are the only carnivorous animals that change from the brown of summer to a white winter coat. With them it is likely that the protective winter color serves them more in permitting them to approach their intended victims unseen than in protecting them from their own enemies.

Several species of animals spend a large part of the winter season in a lethargic sleep called hibernation. These include the bear, marmot, ground squirrel, chipmunk, and some of the mice. While hibernating these animals have extremely slow heart action and their bodily temperature falls far below the normal of their active periods. Certain animals such as the chipmunk may revive and appear again during protracted warm spells but the bears once they den-up after the first cold spells are not seen again until they emerge in the spring.

Other animals like the deer and goat solve the winter food shortage by migrating to lower elevations and the predatory animals by following and preying upon them. Still others have highly developed storage instincts and spend their summers in laying up

Columbia Black-Tailed Deer

Buck (Above)
Doe (Below)

food supplies for the long winters. Notable among these are the squirrels, the wood rats, and the cony or rock-rabbit. The food is usually stored in bulk but squirrels often bury individual cones or seeds here and there, depending upon their keen sense of smell to recover them again. This habit coupled with the fact that many of the seeds are never recovered makes the squirrel the chief planter of trees in the woods. Many a giant tree owes its existence to the fact that a little squirrel buried a seed in the ground and forgot where he put it. Of these "farmer" animals the cony is perhaps the most talented at storing food. He has learned that green plants if stored underground mould and decay so he piles his hay on the rocks and allows it to cure in the sun before storing it beneath for his winter's food. These haycocks of the conies are a common sight on almost any rockslide late in the summer.

Columbia Black-Tailed Deer

(Odocoileus columbianus columbianus)

Size: Big bucks stand around 3½ feet high and approximate 200 pounds.

General Color: In summer, rich rusty red; in winter, grayish brown.

Identification: This is the only variety of deer aside from the elk found in the park. The short, black tail is a distinctive mark.

Occurrence: Found generally distributed around the mountain, in the meadows and timber up to 6,000 feet elevation.

Remarks: Deer are present in the Park in large numbers but because of the shyness of the animal and the liberal cover afforded by the dense forests they are not so often seen. Even so it is not at all uncommon to

find them crossing the road before a car or hesitating for an instant in the trail to stare at the approaching hiker. No finer sight is vouchsafed one in the woods than that of a family of deer among the flowers of the open meadows.

The Rangers become very familiar with the does and fawns around their cabins in the early spring or late fall but bucks seldom become accustomed to human beings. The young, normally two in number, are born during May and June. Their backs are covered with small round white spots at birth which are carried the first season. The horns of the black-tailed deer fork like the mule deer rather than branch like the white-tail. Tracks are about 2½ inches long and pointed.

Wapiti, Olympic Elk, Roosevelt Elk

(Cervus canadensis occidentalis)

Size: The elk, stateliest of American deer, become the size of domestic cattle but with longer legs.

General Color: Gray-brown with white or buff rump patch.

Identification: The large size and miniature tail are sufficient to identify the elk.

Occurrence: At one time elk ranged through the forests and parklands of the reservation in large numbers. Before the Park was established they were almost exterminated by hunting but recently they are reappearing in small bands.

Remarks: The Olympic elk, so-called because it is found in great numbers in the Olympic Mountains, is slightly larger than the elk of the plains country and is a browse-feeding animal rather than a grazing animal such as the plains elk are. Mature bulls carry a

(Photograph by Harmon)

Wapiti or Elk

Stateliest of the deer family

(Photograph by Harmon)

White Mountain Goat

True Mountaineers

magnificent set of antlers and during the rutting season are the most dangerous animals found in the Park. It is not wise to attempt to approach too near these animals. Elk tracks resemble in size and shape those made by domestic cattle.

White Mountain Goat

(Oreamnos americanus americanus)

Size: Old billies will weigh 350 to 400 pounds.

General Color: Entirely white except for black nose, horns, and hoofs.

Identification: There is very little danger of confusing this awkward-appearing animal with any other, in fact, very few other animals inhabit the same range as the goats. The shaggy white hair and short unbranched horns are sufficient to identify the mountain goat.

Occurrence: Found all around the mountain in the region of timberline. Particularly abundant in Van Trump Park, around Panhandle Gap in the region of Sluiskin Mountains, Spray Park, and Indian Henry's Hunting Ground.

Remarks: Contrary to the case elsewhere the mountain goat of the Park is extremely wary. Tracks and shed wool are found everywhere, but it requires a skilled hunter to approach near the animals. Living amid glaciers, rocky crags, precipitous cliffs, and pumice fields, the mountain goat has a habitat on Mount Rainier, the superior of which in scenic grandeur would be very hard to find. Remarkably light on his feet for so heavy-bodied and clumsy-appearing an animal, he is able to negotiate ice and rock slopes of unbelievable steepness. His size, sure-footedness, conspicuousness, herding instinct, and habit of posting lookouts when

feeding, make the mountain goat unquestionably one of the most interesting animals in the Park. The kids, usually two in number, are quite as active as their parents. The tracks are about the size of those of the deer but with blunt tips.

Black Bear

(Ursus americanus)

Size: Length up to 6 feet. Weight between 200 and 400 pounds.

General Color: Black or cinnamon brown, both color phases occurring in the same family, often indeed in the same litter.

Occurrence: Found throughout the Park in suitable situations. Particularly abundant in the open meadows and parklike regions during huckleberry time.

Remarks: Bear occur in greater numbers in the Park than one might at first suppose. The abundance of cover and their native shyness militates against their being seen. Individuals that have been fed, around the hotels and camps, become quite fearless and can be seen about dusk almost any evening in the summer time as they come for their food. As many as a dozen bears of all sizes may be seen at one time, on occasion, near the Public Automobile Camp in Paradise Valley. Bears usually hibernate in dens of rock or large hollow-based cedars from early in December until well into March. The young, usually two in number, are born in midwinter while the mother is hibernating. When born, baby bears are the smallest animals compared with their mature size of any of our mammals. When the cubs appear with their mothers early in the spring

Black Bear

A brown mother bear with a black cub

they stand about twelve inches high and are not long in taking on their characteristic rounded appearance. Bear are among the most common of the larger animals seen by visitors and never fail to create a great deal of interest.

Cougar, Mountain Lion

(*Felis oregonensis oregonensis*)

Size: Large individuals attain a length of 8 feet, stand 35 inches high, and weigh around 200 pounds. The female averages considerably smaller.

General Color: Tawny yellow.

Identification: The long heavy tail, cat-like movement, and great size distinguish this animal from any other.

Occurrence: Cougar follow the herds of deer and therefore keep in the neighborhood of the forests. They are not abundant in the Park but individual animals range over large areas and their tracks are frequently seen.

Remarks: Variously known as mountain lion, puma, panther, and catamount the cougar at one time ranged through most of the forested sections of temperate America. These great cats are still fairly abundant in the western mountains and are the most destructive of our predatory animals. It is estimated that a mature cougar will kill as many as 100 deer during a year in sections where deer are plentiful. They are hunted occasionally by the Rangers in order to keep them under control. All the cat tribe are nocturnal in habits and are rarely seen. The author has lived in the Park for years and has never seen nor heard one of these animals although prowling tracks are often found near the houses and several animals are

hunted with dogs and killed each year. The track is similar to that of the domestic cat but from 4 to 5 inches in diameter.

Bobcat, Wild Cat, Bay Lynx
(*Lynx vinta*)

Size: About that of an Airedale dog. Weight about 30 pounds.

General Color: Yellowish brown with irregular brown spots.

Identification: Catlike shape and short stubby tail with white tip and black band above.

Occurrence: Abundant all through the Park below timberline.

Remarks: This common wild cat is found well distributed through the forests and park lands and does considerable damage to the wild life, particularly fawns and the smaller birds and animals. They are seldom seen even by the Rangers, but bobcat, lynx, and coyote tracks may be found in almost any dusty trail at almost any time. They are readily treed by dogs and are not particularly difficult to trap.

Canada Lynx, Wild Cat
(*Lynx canadensis canadensis*)

Size: About the same as the bobcat but with larger feet and longer legs. Weight under 30 pounds.

General Color: Similar to the bobcat, usually a shade lighter.

Identification: Larger tracks and the presence of tufts or tassels of hair on the ears serve to distinguish the lynx from his cousin the bobcat.

Occurrence: Range similar to that of the bobcat.

Remarks: The habits and characteristics of the Canada lynx do not differ greatly from those of the bobcat. The young, several in number, are born in dens in the rocks or hollow logs. They greatly resemble the kittens of ordinary house cats except for the brown spots. Their food consists largely of snowshoe rabbits, squirrels, grouse, and other smaller birds and animals, but there is no question that both the bobcat and the Canada lynx do considerable damage to the young of deer, elk, and goats, and apparently they are the beaver's greatest enemy. The tracks are almost round and very similar to those of a domestic cat but about twice the size.

Timber Wolf, Gray Wolf

(Canis gigas)

Size: That of a large dog.

General Color: Brown to gray.

Identification: The larger track and much greater size distinguish the wolf from the coyote which is the only animal it might be confused with.

Occurrence: Timber wolves are only occasional visitors to the region of the Park. Like the cougar they follow and prey upon the deer and goat but also destroy many rabbits, grouse, and other small animals.

Remarks: Years ago Timber Wolves were quite abundant in the Cascades but during recent years only a very few have been seen and on a hundred and fifty mile trip over the trails of the Park the author found the tracks of only two wolves. Wolf tracks resemble very greatly those of a large dog in shape and size. It is well for the other wild life of the Park that wolves have been practically exterminated.

Mountain Coyote, Prairie Wolf

(Canis latrans lestes)

Size: About the size and shape of a Collie dog.

General Color: Brownish gray.

Identification: The doglike appearance of the coyote is unmistakable.

Occurrence: The prairie wolf is without doubt the most abundant predatory animal in the Park. It is found well distributed everywhere below the snow line but prefers open ridges and meadow lands.

Remarks: The coyote, formerly a plains animal, has been driven by the advance of the last frontiers to adopt a home in the high mountains. However, he apparently has suffered no great depletion in numbers by the change, and readily adapts himself to his new environment. An interesting effect has been a lessening of the tendency to "yelp at the moon." One misses the evening serenades so frequently heard in prairie regions. Dens are usually made by enlarging a marmot or mountain beaver hole and sometimes two litters of young are born in a season. The tracks are very similar to those made by a medium-sized dog. Coyote and wolf tracks are distinguished from those of the wildcats and cougar in that the claws show in the tracks of the former and not in those of the latter.

Cascade Red Fox

(Vulpes cascadensis)

Size: That of a small dog with a heavy bushy tail.

General Color: Normally reddish, with color phases ranging through gray to blue-gray and black.

(Photograph by L. D. Lindsley)

Coyote Tracks in the First Snows of Winter

Identification: The pointed nose and ears and heavy brush with white tip are the marks of the Cascade red fox.

Occurrence: Found generally distributed over the Park, preferring open parklike regions and high alpine meadows. Not found in large numbers anywhere.

Remarks: The red fox, like the black bear, is about as often found disguised under some color phase as in his typical color. The gray and blue-gray phases commonly called cross and blue fox are often met with. The black phase is quite rare but not unknown within the Park. The fox is a persistent hunter and one individual will make miles of trail over the alpine meadows in his morning search for grouse. The tracks are similar to those of a small dog and are most often seen following the first snows in the fall. They are often found in the high meadows early in the spring.

Hoary Marmot, Whistler

(*Marmota pruinosa*)

Size: Considerably larger than an eastern woodchuck. Weight about 30 pounds.

General Color: Black, brown, and gray. Face, black. Back, brown, grizzled with gray. Tail and under parts—brown. Feet, black.

Identification: Any animal of heavy-bodied appearance, about the size of a badger, noted on the rockslides or meadows nearby, is sure to be a marmot.

Occurrence: Abundant in the vicinity of rockslides from the edge of the heavy forests to timberline and somewhat above.

Remarks: The hoary marmot is one of the animals most commonly seen along the upper reaches of the mountain roads. Individuals become so tame that

they apparently pay little attention to passing automobiles. The clear and penetrating whistle of the marmot is classed with the best of the wild music of the mountains. On still days this call can be heard for long distances. The facility with which the animal traverses rockslides and steep slopes would scarcely be anticipated in an animal of so heavy body and awkward an appearance. The reposeful demeanor of the marmot, as it sits quietly on some convenient rock as one approaches, gives little evidence of the struggle between curiosity and caution taking place within. During June the young appear with their parents, and seating themselves on some handy boulder stare at the observer with a comical gravity. The picture furnished by the glorious amphitheater-like cirques of the Park with their precipitous walls, glaciers, snowfields, and rockslides and their forests and flowers, would scarcely be complete without the whistler. Toward the end of the season the marmots become excessively fat and before the arrival of winter they retire to their dens and begin the long hibernating sleep which lasts more than half of the year. Early in the summer they are out again to greet the first visitors into the alpine meadows. The hoary marmot is the typical animal of the high country.

Raccoon

(*Procyon lotor pacifica*)

Size: About that of the hoary marmot.

General Color: Gray. Face, marked with black. Tail with black rings.

Identification: The pointed nose and ears, heavy body, and ringed tail are unfailing marks of the "coon."

Hoary Marmot, or Whistler

Occurrence: Found sparsely through the lower valleys of the Park, particularly along marshy streams.

Remarks: Raccoons are among the cleverest and most interesting of mammals. Their attractive appearance and cunning ways make them splendid pets. They are good swimmers and occupy much of their time with fishing. So sanitary is the "coon" in his habits that every bit of food must first be taken to the stream and washed before eaten. Being a nocturnal animal he is rarely seen. The track of the rear foot greatly resembles that of a tiny baby, and is often seen in the snow or mud near the streams of the lower valleys.

Marten, American Sable

(*Martes americana caurina*)

Size: Weight, only five or six pounds, but nearly three feet in total length.

General Color: Rich brown with darker tail and legs.

Identification: At a distance a marten resembles a small fox. The brush, however, is smaller and not tipped with white and the ears are not so pointed.

Occurrence: Found commonly in the woods from 4,500 feet to timberline.

Remarks: The marten is the most handsome of the weasel family. The fur is highly prized and over much of their range the animals have been almost exterminated. They are quite abundant in the Park and are much less shy than is ordinarily the case. Frequently they hunt through the hotels and camps during the winter for mice, rats, and weasels which they prey upon. Out of doors they hunt largely in the tree-tops, springing from tree to tree with the agility of squirrels, and are very destructive to small animals and birds. The

trail is easily distinguished because the feet are put down in pairs with a normal span of from two to three feet between tracks. The author has measured single leaps, uphill, of more than fourteen feet.

Fisher, Fisher Marten

(*Martes pennanti pacifica*)

Size: About that of the raccoon but built on slimmer lines measuring some 30 to 38 inches in total length.

General Color: The heavy soft fur of the fisher is usually light brown above with nose, tail, and legs black or dark brown.

Identification: The fisher resembles its near relative, the pine marten, but is considerably larger. It may be known by its size and the dark legs and tail.

Occurrence: Very few fishers are found in the Park. In fact, the animal is becoming extinct with alarming rapidity over all its range in spite of its shyness and cunning. Fishers prefer the darkest of the heavy forests but are influenced in their range by the available food supply.

Remarks: Contrary to what his name might imply, this interesting animal does not fish. Although he is able to swim with extraordinary ability when necessary he regards water with considerable loathing. The fisher has been aptly described by William MacMillan as having the silhouette of a marten, the steel muscles of a wolverine, and the cunning of a weasel. In spite of his short legs he can cover the ground with amazing speed but it is in the tree-top that he is most at home. Here he has no difficulty in running down and capturing the red squirrels which with rabbits and grouse make up the bulk of his food.

Wolverine
(Gulo luscus)

Size: About that of an English bulldog. Total length about 42 inches.

General Color: Varies from rich reddish brown to almost black with black feet and black tip to tail and nose.

Identification: Dr. Hornaday has described the wolverine as a cross between a badger and a bear. No other animal except a large marmot might be confused with the wolverine. However, few people aside from professional trappers ever have opportunity to identify this rare animal in its native habitat.

Occurrence: Wolverines are reported only occasionally in the Park. They are still fairly abundant in parts of Alaska, Canada, and the Northwest but have been driven from much of their range. They are a forest animal.

Remarks: Much has been written of the cunning and meanness of this animal. Some of the stories of its diabolical cunning and initiative seem almost incredible. It robs traps, cabins, and food caches and destroys what it cannot carry away. In proportion to its size its molar teeth are enormous, and its appetite and strength match its teeth.

The wolverine was known to the Indians of the Northwest as Mountain Devil because of its enormous strength, savage, gluttonous disposition, and cunning tricks. The tracks of the wolverine resemble those of the marmot but are larger.

Otter
(Lutra pacifica)

Size: Length about 42 inches. Slender.

General Color: Dark brown.

Identification: There can be no mistaking this slick, web-footed quadruped with the actions and aquatic ability of a seal.

Occurrence: Noted only rarely along the streams of the Park.

Remarks: The otter is a great lover of water and is seldom found far from some stream or pond where fish are plentiful. No other land animal swims and dives with the skill of the otter. The beaver which spends its life in or near water is clumsy by comparison. Otters build dens or burrows in the banks of streams and slide into the water. They are very playful, spending hours at a time sliding down the bank and sporting in the water. Their food consists largely of fish which they catch with ease. The fur is very valuable and comes largely from Alaska.

American Mink

(*Mustela vison energumenos*)

Size: About twenty inches in length weighing around two pounds.

General Color: Rich brown to almost black.

Identification: The only weasel-like animal found along streams.

Occurrence: Found only in the lower valleys of the Park in the vicinity of streams and marshes.

Remarks: The American mink is another of the weasel family which is much sought after for its fur. It is equally at home on land or in the water, diving and catching fish with otter-like agility. It is a restless animal, active both by day and by night, although mainly nocturnal. Mink are occasionally seen by fishermen along the lower streams.

Washington Weasel
(Mustela washingtoni)

Size: That of a chipmunk but longer.

General Color: Yellowish brown with white underparts in summer and pure white in winter except tip of tail, which is black.

Identification: The small size and snakelike proportions of the flattened head distinguish the weasel from others of its family.

Occurrence: Abundant wherever birds and small rodents are numerous. Particularly common around the hotels and camps.

Remarks: Weasels are wonderfully endowed for their predatory work and are undoubtedly the most perfectly organized machines for killing that have been developed among mammals. Their slender forms enable them to follow their prey to the remotest depths of their retreats and their wanton destruction among the smaller rodents and other small animals is appalling. The tracks of the weasel occur in pairs like those of the marten with a normal span of about one foot.

Least Weasel
(Mustela rixosa)

Size: About half that of the Washington weasel.

General Color: Similar to the Washington weasel but lacks the black on the tail.

Identification: The minute size and short tail, not tipped with black, identifies this weasel from his cousins.

Occurrence: The little weasel inhabits practically the same range as the Washington weasel. It is not abundant in the Park.

Remarks: This smallest of all carnivorous animals feeds almost exclusively upon mice, shrews, moles, and other small animals, and is, therefore, a valuable friend of the hotel and camp keepers, particularly during the winter when small animals become something of a pest. The little weasel has most of the habits and characteristics of his larger cousin but is so diminutive in size that he can follow wherever a mouse can go. Both weasels are very quick and active and burrow through fresh snow as rapidly as a man can walk. Burrows left by this tiny weasel in earth or snow are little, if any, larger than a man's finger.

Little Spotted Skunk, Civet Cat

(Spilogale putorius)

Size: About that of a large squirrel.

General Color: Black background with white spots and stripes.

Identification: The skunk needs no introduction.

Occurrence: Found chiefly around seldom-used cabins and in the vicinity of camp. Not common, however.

Remarks: This distant relative of the weasels is quite different in habits. He is the same little "pole cat" that is known as the "phobie cat" or "hydrophobia skunk" in the Southwest where it is a well-known fact that it sometimes carries rabies. However, no instances are known where infection resulted from the bite of the Northwestern variety of skunk. It is entirely nocturnal in habits and feeds largely upon small animals and insects with some vegetable matter for variety. The young, from two to six in number, are decidedly cunning and quite "harmless."

Mountain Beaver, Sewellel, Chehalis

(*Aplodontia rufa phæa*)

Size: About that of a common rabbit.

General Color: Uniform dark brown.

Identification: The absence of any semblance of a tail distinguishes the sewellel from the marmots, muskrats, and others near his size.

Occurrence: Abundant only in the lower valleys where the heavy forests are cool and the bracken and underbrush-covered ground oozes with moisture.

Remarks: The mountain beaver is a peculiar animal with no near relatives. He is mainly nocturnal in habits, lives in tunnels underground, and is a vegetarian, living chiefly upon succulent roots, bark, and tender twigs. Like the cony it gathers little hay piles for winter food supply and is active all through the year making an extensive system of tunnels under the snow in the winter.

Muskrat

(*Fiber zibethicus osoyoosensis*)

Size: That of a rabbit, resembling a rat in shape.

General Color: Rich brown with lighter under parts.

Identification: The smooth flattened tail and tiny ears serve to distinguish the muskrat.

Occurrence: Found only in the lower valleys of the Park along suitable streams and ponds.

Remarks: The muskrat is classed as America's most valuable fur-bearer. The fur is almost equal to that of the beaver in texture and is coming into very common use both natural and clipped and dyed, in which condition it is usually sold as "Hudson Seal." Aquatic in habits and mainly nocturnal, the muskrats

hold their own if merely given a suitable environment. Their food is largely vegetable and is found near the streams. Occasionally they build houses or lodges similar to those constructed by the beaver although smaller. It is interesting to note that these animals are closely related to the common short-tailed field mice.

American Beaver

(Castor canadensis pacificus)

Size: About that of a large marmot.

General Color: Brown.

Identification: The flat paddle-shaped tail is the unfailing mark of the American beaver.

Occurrence: Inhabits streams and marshy areas of the Park up to 3,000 feet elevation.

Remarks: The beaver is the engineer of the animal world and because of his dam, canal, and house building propensities is one of the most interesting animals in the Park. There are dams in the vicinity of the Nisqually entrance that are two hundred or more feet in length and four feet high, and the author has measured cottonwood trees cut by beaver that were as much as 26 inches in diameter. Trees are cut and felled into the ponds where it is an easy matter to remove the limbs to be used in repairing dams, or building houses, or the tree can be cut into billets of a size that can be handled and stored away underwater to serve as a winter food supply. Only the bark is eaten. Houses or lodges are very seldom seen as the animals usually find suitable dens under the protruding roots of trees or in dirt banks. A few fine examples of beaver houses, however, are found in the Park. Being almost nocturnal in habits, beaver are seldom seen at work but it is well worth the effort to visit their cuttings and

dams which can be found within a few minutes' walk of the automobile roads. Beaver, because of the value of their fur, led many of the first explorers into the west and north, and therefore have had no small part in the exploration and development of America.

Douglas Squirrel

(*Sciurus douglasi*)

Size: Somewhat smaller than the eastern gray squirrel.

General Color: Dark brown above, under parts lighter. Tail bordered with gray.

Identification: This is the only tree squirrel found in the Park.

Occurrence: Well distributed all over the region up to and sometimes above timberline.

Remarks: A bundle of restless energy, the Douglas squirrel is always one of the most interesting mammals of the woods. On seeing you suddenly he appears to be almost overcome by his nervous excitement, and running jerkily up the nearest tree he calls down imprecations upon you for disturbing the quiet of his peaceful woods. His song at other times is a rapid trilling or bubbling series of notes, long drawn out and sometimes varied by cadences. It is so musical that very frequently these animals are mistaken for some strange bird. They are decidedly energetic and spend most of their time in late summer in storing up great caches of Douglas fir cones, the seed of which form their principal food. In the winter they are able to locate these storehouses under the snow with unerring certainty. Probably more people become acquainted with the Douglas squirrel than with any other animal in the Park except the chipmunks.

Flying Squirrel

(Glancomys sabrinus fuliginosus)

Size: About that of a large chipmunk.

General Color: Light yellowish brown above—buff below.

Identification: Their ability to soar from tree to tree is an unfailing mark.

Occurrence: Found sparsely throughout the forested areas of the Park.

Remarks: By extensions of the skin between the legs the flying squirrels are able to jump and soar considerable distances from elevated positions. No one can see these little creatures in life without being charmed by their delicate grace of form, and lively intelligence. Unfortunately being decidedly nocturnal in habits and not particularly plentiful they are rarely seen even by the Park Rangers.

Columbia Mantled Ground Squirrel

(Citellus columbianus columbianus)

Size: About that of the Douglas squirrel.

General Color: Back grayish brown with black and white lengthwise stripes. Under parts lighter.

Identification: The larger size serves to separate the ground squirrels from the chipmunks and the presence of stripes distinguishes them from the Douglas squirrels.

Occurrence: Ranges from an elevation of about 3,000 feet to 8,000 feet and occasionally individuals go as far as the rim of the crater (14,160 feet). Rare on the west side.

Remarks: The mantled ground squirrels are friendly little animals and are possessed of unusual intelligence. They are very abundant around the upper hotels and

camps and quickly become accustomed to human society. They will readily take food from the hand upon a little coaxing which they stow away in their cheek pockets, apparently to the point of bursting them, before scampering away to their home. In July it is not an uncommon sight to see them carrying their half-grown young from one den to another. When this occurs it is fairly certain that weasels are lurking in the vicinity.

Little Chipmunk

(*Entamias townsendii*)

Size: About one-third the size of a ground squirrel.

General Color: Grayish brown with nine stripes lengthwise on the back, alternating dark brown and lighter.

Identification: The brownish rather than silver grayish margins of the tail separate this high altitude chipmunk from the lower Cooper chipmunk.

Occurrence: In open situations everywhere between 4,500 feet elevation and 7,000 feet. Occasionally found at Anvil Rock, Fire Lookout, and Camp Muir (10,000 feet).

Remarks: The chipmunk of the open alpine park country such as Paradise Valley is slightly smaller and a trifle paler than the chipmunk of the lower slope forests. Chipmunks are more commonly met with by visitors than any other animal in the Park and their bright eyes, sharp, nervous call notes, curiosity, and generally vivacious and sprightly temperament make them decidedly attractive. To meet with these handsome little animals while eating lunch on a log in the woods or on the top of some mountain peak and find that with a little coaxing one will perch upon

one's fingers and eat from one's hand gives the visitor a feeling that he has made a real friend. Chipmunks hibernate during the colder periods of the winter.

Cooper Chipmunk

(Entamias cooperii)

Size: Slightly larger than the little chipmunk but the difference in size is almost indiscernible.

General Color: Similar to the little chipmunk but a shade darker in color.

Identification: The silver gray tail margins distinguish it from the little chipmunk.

Occurrence: Found well distributed over all the Park up to or almost to timberline.

Remarks: The Cooper chipmunk takes the place of the little chipmunk through the lower sections of the Park. Their habits and characteristics are similar.

Rainier Pocket Gopher

(Thomomys douglasii shawi)

Size: About that of a house rat or larger.

General Color: Dark gray to rusty brown.

Identification: Large size and mole-like build.

Occurrence: Not common in the Park. Inhabit open meadows in the low valleys such as Bear Prairie.

Remarks: These seldom-seen rodents are great miners. Practically their whole lives are spent underground, except when for a few minutes an opening is made to the surface, the loose earth pushed out, and a few plants quickly cut and stuffed into the capacious fur-lined cheek pouches to be carried back into the burrows for food.

Two Small Rodents Abundant in the Park

Rock Rabbit or Cony

The little haymaker that lives in the rockslides about timberline

Chipmunk

Abundant all over the Park in the Woods

Varying Hare, Snowshoe Rabbit

(*Lepus bairdii cascadensis*)

Size: About the size of domestic rabbits.

General Color: Rabbit brown in summer, lighter below. Pure white in winter.

Identification: The varying hare is the only hare found in the region of the Park.

Occurrence: Found abundantly in the lower regions of the Park. Occasionally found as far up as the alpine meadows around 4,500 feet elevation.

Remarks: The snowshoe rabbit, so-called because the large hind feet with their long spreading toes are entirely covered with a heavy coat of hair, forming broad snowshoe-like pads, which enable their possessors to move about freely over the soft snow so plentiful in the Park during several months of the year, is not a rabbit, but a true hare of the genus *Lepus*. Unfortunately for them these hares have numerous enemies and furnish a large part of the food of the wild cats, coyotes, wolves, and weasels. Due no doubt largely to their snow-white winter coat and their habit of "freezing" and remaining perfectly immobile in their "forms," great numbers escape and in the lower valleys they are everywhere abundant. This change from the summer brown to the white of winter and back to the brown again in the spring follows very closely and is apparently dependent upon the coming and going of the snow. Snowshoe rabbits are mainly nocturnal in habits but are often seen late in the afternoon and occasionally all through the day particularly during the early summer. They live almost entirely upon bark, grass, and small herbage. The young, from 2 to 7 in number, are born early in the summer in nests made from grass and lined with fur from the mother. They

are fully furred, have their eyes open, and are very active even when quite young. There is another species closely related to the varying hare (*Lepus washingtoni*) which lives in the heavy forests surrounding Puget Sound below the snow line, which, although it is closely related, does not have the seasonal changes of color.

Cony or Rock Rabbit

(Ochotona tenisex brunnescens)

Size: About that of a guinea pig.

General Color: Brownish gray.

Identification: The cony is a small, grayish-brown, rabbit-like animal, lacking any visible tail and possessing large round ears.

Occurrence: Very abundant in suitable rockslides from 2,500 feet to timberline and somewhat above.

Remarks: No talus slope amid the inspiring and vivifying influence of timberline scenery would be complete in the absence of the "cony that lives in the rocks." In spite of the fact that conies are soft-bodied, delicate creatures and must furnish, occasionally, a delicious morsel for the ever-active marten, weasel, coyote, or eagle, they seem to thrive well in their unusual surroundings. They have taken literally the injunction to make hay while the sun shines. In the late summer and fall, piles of vegetation in various stages of accumulation and drying form a conspicuous feature of cony rockslides. Conies, called Pika or "Little Chief," by the Indians are related to the hares and rabbits although very different in habits. These little fellows are found in practically every mountainous region of the northern hemisphere. The cony mentioned several times in the Bible is a different animal however. Their call notes have a curiously

Winter, Spring, and Summer Color Phases of the Varying Hare
or Snowshoe Rabbit

ventriloquial quality, which along with their protective coloring renders it difficult to locate the animals uttering them. No one who once becomes acquainted with these unique and gentle little animals and their peculiar little nasal "echs" will ever cease to remember them with friendly interest.

Wood Rat, Pack Rat, Trade Rat

(Neotoma cinerea occidentalis)

Size: About that of an ordinary black rat.

General Color: Soft shades of gray, buffy, or ferruginous above. Snowy white or buffy below.

Identification: The prominent black eyes, large round ears, and the flattened bushy tail, but otherwise rat-like appearance, serve to identify the pack rats.

Occurrence: Found throughout the Park in favorable situations as far as timberline, preferring the vicinity of camps and cabins.

Remarks: Despite a certain superficial resemblance in size and appearance, wood rats are not related to those exotic parasites, the house rats, with coarse hair and bare tails, but are far more attractive and handsome animals. They are decidedly nocturnal in habits and are seldom seen even where numerous. Their presence is usually indicated by accumulations of odds and ends in the vicinity of their retreats. Apparently these piles are made merely for amusement as they usually contain such worthless objects as bones, tin cans, small sticks, bits of bark, stones, and other small objects. Frequently, however, one finds nests composed almost entirely of edible plants. No sooner does the light go out, than they begin the incessant patter, and drumming with their hind feet, that make

the nights miserable for dwellers in mountain cabins. In certain localities they are known as "trade rats" because they sometimes carry away small loose objects and replace them with worthless rubbish.

Brown Rat

(Rattus norvegicus)

Size: About sixteen inches in length.
General Color: Dark brown.
Identification: The coarse hair and smooth tail distinguish these Old World parasites from any rats native to America.
Occurrence: Found only rarely in the Park.

House Mouse

(Mus musculus)

Size: Four to six inches in length.
General Color: Mouse gray.
Identification: The house mouse may be known from any native species by the nearly uniform color both above and below and the long hairless tail.
Occurrence: Found occasionally about buildings. Not common.

Deer Mouse, White-Footed Mouse

(Peromyscus leucopus)

Size: Slightly larger than the ordinary house mouse.
General Color: Gray brown above and white below.
Identification: The larger ears serve to distinguish the deer mouse from any of the meadow mice and the

white feet and under parts separate this mouse from the house mouse.

Occurrence: Throughout the Park at practically all altitudes. Has been noted at the crater rim.

Remarks: The white-footed mouse finds congenial surroundings in almost any sort of habitable situation. Since the animals are active only at night they are not often seen. In spite of the fact that they often become a pest in camps and cabins, their bright eyes and agile movements render them not altogether unattractive as Park residents. The lacelike parallel rows of tracks often seen on the snow or in the dust are the work of the deer mice.

Western Red-Backed Mouse

(Evotomys gapperi occidentalis)

Size: Somewhat larger than a house mouse.

General Color: Back reddish, remainder of upper parts grayish brown; under parts paler.

Identification: The reddish color of the back suffices to distinguish the red-backed mouse from any of the meadow mice; its short tail and small ears separate it from the deer mouse.

Occurrence: Everywhere up to timberline.

Remarks: If one will quietly walk into the heavy forests and seat himself in some comfortable place where there are many mossy logs and watch for some minutes, he is almost sure to catch sight of a red-backed mouse. Perhaps a streak and a shadow is about all he will see, but often the mouse will proceed with sufficient deliberation to afford an adequate view. Finally, in all likelihood, the mouse will dodge into a hole in a stump or disappear in a burrow beneath some mossy log

Jumping Mouse

(Zapus trinotatus trinotatus)

Size: Slightly smaller than a house mouse with extremely long tail.

General Color: Dull rusty brown above and yellowish brown below.

Identification: There can be no mistaking these little kangaroo-like mice with their slender tails and long hind legs.

Occurrence: Found in suitable locations up to and perhaps above timberline.

Remarks: The jumping mice are among the most interesting of small animals. The unusual tail, which is the most prominent feature of this mouse, serves as a balance during the extraordinary leaps, some of which cover a distance of about ten feet. Unlike most of its relatives, the jumping mouse hibernates during the winter.

Large-Footed Meadow Mouse or Water Rat

(Microtus richardsoni)

Size: About three-fourths the size of a brown rat.

General Color: Bluish gray.

Identification: A shy bluish-gray creature with inconspicuous ears, and no bright colors or conspicuous markings.

Occurrence: Usually in the moist park country from 4,500 feet to timberline and above.

Remarks: This is the largest of five species of meadow mice found in the Park. It is not infrequently seen in the moist mountain meadows slipping furtively along its runways. The animal is very much at home in the water where it swims and dives with facility.

It is, however, a very adaptable animal and is known to live on dry slopes far from water.

Meadow Mice, Field Mice

Microtus sp.

Four other species of *Microtus*, the Rocky Mountain meadow mouse, Olympic meadow mouse, Oregon meadow mouse, and Rainier meadow mouse, are found in the Park. As a rule field mice prefer low-lying fertile meadow land. Their runways and nests are a conspicuous feature of such meadows as those at Longmire Springs, Bear Prairie, or Mountain Meadows, as well as in suitable situations of the high alpine parks. Walking through the grass in such places one frequently gets a fleeting glimpse of a tiny animal scurrying for shelter. Seldom does the mouse hesitate long enough for more than a glimpse, however. Meadow mice are cunning little beings with short tails, well rounded bodies, beady eyes, and ears almost hidden by the soft coat of gray-brown fur. During the winter they are still very active digging extensive networks of tunnels under the snow in their search for food.

Mountain Lemming Mouse

(*Phenacomys intermedius olympicus*)

These rare little lemming mice somewhat resemble the meadow mice with their small ears and well-rounded appearance. They may be distinguished by their smaller size, and light gray color. Their habits seem similar to those of the meadow mice and they inhabit the same sort of localities. They are perhaps common but are rarely seen.

Moles

Scapanus sp.

The order of Insectivora or insect-eating mammals is well represented in the Park by three species of moles, five shrews, and three bats. Of the moles the Townsend or Oregon mole is the largest and most commonly found. The coast mole is also abundant and Gibbs's shrew mole is found forming a sort of link between the moles and their relatives, the shrews. The presence of moles is indicated by ridges of dirt and "mole hills" of loose dirt found almost anywhere where the soil is moist, from the dense forests to the open parks. Moles lead a very strenuous life as they spend most of their time burrowing for earthworms and the larvæ of insects. At night they frequently follow the worms to the surface and many are killed by owls and other night prowlers. Structurally they are well suited for this mode of life with their pointed noses, well muscled forepaws, and compact bodies. Eyes and ears are of little use underground so they have become practically obsolete. The fur is short and velvety and will lie equally well in any direction.

Shrews

Neosorex sp. and *Sorex* sp.

Shrews are tiny members of the order of insect-eaters that are apparently related both to the mice and the moles. Five species are found in suitable localities from the Park border to timberline and slightly above. These include the wandering shrew, the dusky shrew, the Trowbridge shrew, the navigator shrew, and the Bendire water shrew. As their names indicate the last two species live near water whenever possible and are quite as much at home in it as on

land. Although active both by day and by night, shrews are seldom seen unless one disturbs the trash heaps or other cover under which they live. All shrews have long flexible noses which serve them in the place of their eyes, which are practically useless. Apparently most of their lives are directed by the senses of hearing and smelling, which are highly developed. Shrews are exceedingly brave and often aggressive, attacking and killing mice twice their size and weight. Since they destroy many harmful insects, their presence is entirely beneficial.

Bats

Eptesicus sp. and *Lasionycteris* sp.

While the moles are searching beneath the soil for insect food and shrews are effectively patrolling the surface of the ground and the small streams the bats are on the alert for all manner of flying insects in the air. Three species are occasionally noted in the Park, the northwest bat, the silver-haired bat, and the large brown bat. They are not very common but are occasionally seen late in the evening, particularly over the open meadows such as those at Longmire Springs. More rarely one finds its way into the hotel lobbies and spends the evening flitting among the lights. They have marvelous control in darting and turning here and there, and no birds, except possibly the chimney swifts, can equal them in their extraordinary gyrations. Bats spend their days hanging head downward from the limbs or on the trunks of trees.

Other Animal Life in the Park

Due largely, no doubt, to the cool dampness of the forest-covered slopes of Mount Rainier and the con-

sequent lack of suitable habitations the list of reptiles and amphibians found within the reservation is very limited. Only one reptile is found—the common garter snake. It is not abundant and is entirely harmless.

Low down in the valleys one occasionally finds the large Pacific toad and everywhere in the small ponds of the high parks are found great numbers of leopard frogs. Certain swampy ponds in the lower forests are alive with small green frogs. Early in the summer their serenades may be heard day and night.

In the shallow ponds of the alpine meadows that are kept warm by the sun, "mud puppies" are frequently found. Strange as it may seem these are merely youthful salamanders that later in the year may be found minus their exterior gills living an entirely different life under rotting logs and leaf mould in the woods. These little animals, although rather repulsive in appearance, are entirely harmless and quite interesting.

CHAPTER XI

Birds of the Park Region [1]

Only two general classes of birds are common within the National Park: those of the deep forests, and the high-altitude types. The absence of the birds of the open fields and the water birds, to a great extent, depletes the bird population considerably; however, there are no grounds for the prevailing opinion that bird life is exceedingly limited within the Park. At least 105 species have been recorded. The apparent lack of large numbers of birds and animals is due not only to the fact that it is very difficult to see in the dense forests that cover two-thirds of the reservation, but also to the fact that only about ten percent of the Park is accessible to automobile travel and many of the birds and animals much prefer the other 90 percent.

However, one who is observant and knows where to look will have no trouble in seeing a great variety of feathered folk.

[1] Much of the material of Chapter XI is from "Birds of the Western United States," by Florence Meriam Bailey, and is used with her permission. Certain extracts have been taken direct from "Birds of the Western United States" and these are used by permission of, and by special arrangement with, the Houghton Mifflin Company, the authorized publishers. The birds described are those listed by Mr. William P. Taylor of the United States Biological Survey. A few species have been added to the list by the author since the Biological Survey of the Park was made in 1919. The classification, nomenclature, and numeration used are those of the American Ornithologists Union's Check-List of North American Birds.

It will be found that these 105 species contain many exceedingly interesting individuals, and that due to the varying elevations birds of all life-zones from the Transition with its numerous and varied forms, to the Arctic, containing only a few hardy species, are found. In fact, practically the same changes in plant and animal life, with its consequential effect upon the distribution of species, will be found in going from the Puget Sound basin to the glaciers of Mount Rainier as would be found on a trip over the thousands of miles from Puget Sound to beyond the Arctic Circle.

Within the Park four life-zones are found, namely, the Transition, Canadian, Hudsonian, and Arctic-alpine. In each of these will be found characteristic birds as well as animals and plant life; and these, it will be noted, correspond rather closely with the types found as one goes toward the polar regions. In fact, many of the species of birds and plants found in the Arctic-alpine zones of Mount Rainier are almost identical with those found above the Arctic Circle in Alaska.

Some of the bird residents are of particular interest because of their rareness or absence over the larger part of the country, or because of traits not found in the more common birds. Only to mention eagles, varied thrushes, band-tailed pigeons, water ouzels, pipits, and ptarmigan, excites immediate interest on the part of bird lovers. All these birds are common in the Park.

The orders of water birds have perhaps the fewest representatives. This is due to the fact that there are no large bodies of water, and no open water during the winter, near the mountain. Ducks are occasionally found nesting near high-altitude lakes where they find conditions similar to their normal nesting ground

farther north. Likely the fact that the mountain is off their migration routes accounts for the fact that this is not a common occurrence. Grebes are occasionally seen on the larger lakes and such waders as the great blue heron, Wilson snipe, and several sandpipers are frequently found around the shallow ponds or on the melting ice fields.

Birds of the open fields and those that prefer to live near the habitations of man are represented within the Park by such types as the western robin, western meadowlark, Brewer blackbird, and various sparrows, bluebirds, and thrushes.

Since much of the region consists of dense forests the birds of the treetops and forest floor are well represented. This class, however, contains relatively few species. Such birds as the western winter wren, the varied thrush, the chickadees, nuthatches, creepers, owls, and grouse are typical of the great forests.

By far the greatest numbers both in species and individuals are found in the sub-alpine meadows. Typical of this region is the Clarke's nutcracker, the sooty grouse, the pine siskin, Shufeldt's junco, and the rufus hummingbird. At timberline and above, the white-tailed ptarmigan, the pipit, and the rosy finch or Leucosticte hold sway while certain species such as the hawks, eagles, steller jay, gray jay or camp robber, and water ouzels may be found in suitable environments in almost any zone.

Still other types such as the woodpeckers, sparrows, warblers, and grouse prefer the burned-over areas where decaying stubs are abundant and the ground is covered with huckleberry bushes and other shrubs.

Circling above mountain and valley, meadow and forest, spending most of their days in midair and always on the alert for chance victims, one finds both

the bald and golden eagle and at least seven varieties of hawks, the desert sparrow hawk being perhaps the most numerous.

Birds famous for their songs are rare in the Park and those that are found are never present in great numbers. Thrushes, though numerous, are rarely heard; meadowlarks are rare and the warblers stay only a few days at most. The bird notes most often heard are those of the little winter wren which sings throughout the year, the water ouzel, chickadees, song and gambel sparrows, kinglets, and juncos.

So-called game birds are represented by the California quails, three grouse, three duck and the Canada goose, the Wilson snipe and band-tailed pigeon. Of these only the grouse are numerous.

Varied as are the types of birds found within the Park boundaries the types of nests built by them are even more varied. These exhibit some remarkable contrasts as well as peculiar forms. From the grouse and nighthawk that make no attempt at building a nest, other than selecting perhaps a depression in the ground, to the artistic little dipper who builds its nest of growing moss kept alive by the spray from a nearby waterfall, practically every imaginable sort of bird home may be found. Chance may reveal to one the lichen trimmed, cobweb nest of the rufous hummingbird and everywhere in the woods are found the large square apartment houses of the pileated woodpecker hewn from living trees. The gray jay though one of the most abundant of the year-around residents, is so skillful at concealing its nest that few have ever been found, while the western robin prefers to lay its mud-lined nest as near as possible to the home of man. Band-tailed pigeons are content with the flimsiest of stick platforms barely sufficient to prevent the eggs falling

through and chicadees and bluebirds find that a deserted woodpecker hole or the cavity of a decaying tree suits their needs, and provides a home with a minimum of effort on their part.

Long before the snow has disappeared at timberline and while the frost is still in the ground, the white-tailed ptarmigan begins rearing its young in the shelter of a friendly stone or gnarled timberline tree, and sooty grouse chicks are already picking up bugs left in cold storage for them on the remaining snowdrifts. These are only a few of the interesting things that await the bird lover. Those who spend even a little time studying them, in the great out-of-door museum that is the Park, will find many, many more.

4. Eared Grebe, Hell-Diver
(*Colymbus nigricollis* var.)

Size: About that of a small duck.

General Color: Blackish, with silvery breast, black neck and head, with yellow ear patches.

Identification: The stiffly carried neck and head with erect crest serve to distinguish this fisherman from the ducks.

Occurrence: Found occasionally and in limited numbers on the larger lakes of the Park such as Mowich and Reflection Lakes where fish are plentiful.

Remarks: Grebes are rarely seen except upon the water where they are very much at home, swimming and diving with great ease. During migration they make long flights.

Since they subsist entirely upon small fish they create havoc among the fry, "planted" in the lakes after much labor at the hand of the Rangers, and are consequently despised by them. Upon being disturbed

they disappear with a flash only to reappear a minute or more later in some distant part of the lake.

130. Red-Breasted Merganser

(Merganser serrator)

Size: About that of the Mallard Duck.

General Color: Male—head and crest black, neck, white, chest, buffy brown streaked with blackish, belly, white or creamy, sides, gray. Female—duller.

Identification: The black head and crest and white neck, coupled with the serrated mandibles, distinguish the Merganser.

Occurrence: Noted only occasionally on the high alpine lakes or streams.

Remarks: Breeding normally in the far north, the few pair that remain in the United States keep to the high mountain lakes and streams. Even the half-fledged young delight in the cold water and foaming rapids of a mountain trout stream. They are good divers and expert fishermen.

143. Pintail

(Dafila acuta)

Size: Slightly larger than a Mallard Duck.

General Color: Male—head not crested, sides, brown. Throat and under parts, white; sides and upper parts, gray crossed by wavy lines; wings, slaty with purple speculum bordered above by a line of buff and below by white. Female—duller, largely gray.

Identification: The large size, long neck, and long sharp tail serve to identify this duck.

Occurrence: Found only rarely on the lakes of the Park.

Remarks: Pintails are not fish eaters like the Mergansers but live principally upon aquatic plants and insects.

Harlequin Duck

(*Histrionicus histrionicus*)

Size: About that of the common Teal.

General Color: Male—head and neck, bluish black with white patches. White collar; chest and shoulders dark plumbeous; belly, sooty; sides, rufus. Duller in summer. Female—head, neck, and upper parts, sooty, with large white spot on side of face.

Identification: The smaller size, long sharp tail, and conspicuous white markings distinguish this rare duck.

Occurrence: Found rarely in the lakes and streams of the alpine valleys.

Remarks: The Harlequin Duck is a beautiful little fisherman of the foaming mountain streams. It seems to derive considerable pleasure from buffeting rapids and whirlpools in order to secure its food.

172. Canada Goose

(*Branta canadensis*)

Size: About that of a small domestic goose.

General Color: Head and neck, black except for white band across throat and cheeks; body, deep gray; rump, tail, and quills, black.

Identification: The large size and prominent band of white crossing throat and cheeks identify the Brant or Canada Goose.

Occurrence: Occasionally noted in migration or resting in the alpine meadows.

Remarks: Few bird notes are more in keeping with

the wildness of the mountainous region than the "honk, honk, ha wank, honk" of a long line of Canada Geese flying with terrific speed overhead. The big strong wings swish loudly and often a low conversational gabble can be heard under the honking.

194. Great Blue Heron

(*Ardea herodias*)

Size: The largest of the herons. Length 45–50 inches.

General Color: Upper parts, bluish gray; top of head, white; under parts, heavily streaked with white and black.

Identification: The size and general blue-gray color easily identify the Great Blue Heron.

Occurrence: Found occasionally frequenting shallow alpine ponds and damp meadows.

Remarks: The great blue herons, when a pair take up their late summer home in some alpine park, add a note of wild beauty to the landscape. They spend most of their time spearing frogs in the ponds.

256. Western Solitary Sandpiper

(*Helodromas solitarius cinnamomeus*)

Size: Length, about 8 inches.

General Color: Upper parts, dark olive gray finely specked with light cinnamon. Wings, black; tail barred with white. Under parts, largely white.

Identification: The Solitary is distinguished from other sandpipers in the field by its darker color and black wings.

Occurrence: Found only occasionally in the Park along streams or on the glaciers.

Remarks: As Vernon Bailey states, they are quiet, shy birds but not unapproachable, and they show an interested curiosity in strangers. Their food is largely the larvæ of insects.

246. Semipalmated Sandpiper

(*Ereunetes pusillus*)

Size: About 6 inches in length.

General Color: Upper parts, dusky and black streaked with gray; chest, light gray; finely streaked chin, belly and sides white.

Identification: This is the smallest sandpiper found in the Park.

Occurrence: Along streams, small ponds, and glaciers.

Remarks: They are nervous active little birds always on the move in their search for food. Semipalmated Sandpipers are often seen in the Park during the summer, usually in small flocks searching the melting snow and ice fields for insects carried there by the wind.

263. Spotted Sandpiper

(*Actitis mascularia*)

Size: About 7 inches in length.

General Color: Upper parts, greenish olive, faintly marked with dusky. Under parts white with round spots of dusky. White line along middle of open wing.

Identification: In the field the Spotted Sandpiper can be recognized by its plain gray color and conspicuous white wing bar in flight.

Occurrence: Found occasionally during the late summer along streams and on the glaciers.

Remarks: In common with others of the family the Spotted Sandpiper has the habit of teetering on every rock it perches on. This becomes ridiculously rapid under excitement or alarm and has given the bird its familiar name of teeter-tail.

230. Wilson Snipe, Jack Snipe

(Gallinago delicata)

Size: About that of Quail.

General Color: Crown buff; back, largely black with lighter stripes. Chest and sides lighter. Belly, white.

Identification: The plump appearance, dark color, long bill, and short legs mark the Jack Snipe.

Occurrence: Found occasionally along marshy streams and ponds through the wooded section of the Park.

Remarks: The Wilson Snipe is a prober rather than a wader, as his short legs and long bill attest. The bill has a sensitive flexible tip useful in searching for worms and other choice bits of food in the soft mud.

297a. Sooty Grouse

(Dendragapus obscurus fuliginosus)

Size: About that of a half-grown chicken.

General color: Upper parts, sooty finely mottled with gray and brown. Under parts, slaty. Tail, blackish with wide bluish gray band at tip.

Identification: This is the Grouse of the high alpine meadows. He is much darker than either the Ptarmigan or Ruffed Grouse and quite different from either in appearances. The tail band is a good field mark.

Occurrence: Found commonly throughout the Park from the edge of the heavy forests to timberline.

Remarks: The hooting of the male Sooty Grouse is a characteristic bird call of the high valleys all through the summer. If you follow up the sound you will usually find him perched close to the trunk high up in an alpine fir perhaps much nearer your camp than the booming "whoo, whoo" led you to believe. As you watch, he sits with spread tail and drooping wings and fills his yellow pouches till his neck looks almost as big as his body, then with a pumping motion of his head he gives his hollow muffled hoot. This may continue at short intervals for hours. Early in July, and throughout the summer, the mother birds with broods of from five to ten chicks are frequently met with on or near the trails. Where hunted the Sooty Grouse becomes very wild and difficult to approach, but within the Park it appears quite fearless, seldom taking to wing but merely moving a few feet out of harm's way. During the long cold winters they subsist largely upon buds and twigs in the treetop homes, but with the coming of spring there are many insects and in the late summer the huckleberries and mountain ash berries supply an abundance of food.

300c. Oregon Ruffed Grouse

(*Bonasa umbellus sabini*)

Size: About that of a small chicken.

General Color: Upper parts, black and dark rusty or reddish brown; tail, deep rusty with black terminal band; under parts, heavily marked with blackish and washed with buffy brown.

Identification: The black neck tufts and black band on tail serve to identify the Ruffed Grouse.

Occurrence: Purely a bird of the forests, found commonly in the lower valleys and occasionally as high as the alpine meadows.

Remarks: While the snow lies deep in the woods the Ruffed Grouse subsists mainly on buds and tender twigs and roosts in the densely branched trees or in holes under the snow. With the first signs of spring the males begin their drumming, a sound produced by beating the wings rapidly against the sides, which has been compared to distant thunder.

Although usually much more shy than the Ptarmigan or Sooty Grouse, a cock is occasionally met with sufficiently brave to dispute the trail with one. Grouse are often seen on woodsy trails because of their love of dust-baths. During the summer their diet is varied by many insects, seeds, and wild berries.

304. White-Tailed Ptarmigan

(*Lagopus leucurus* var.)

Size: Slightly larger than a pigeon.

General Color: In summer grayish buff above, mottled or barred with black. Under parts, lighter but also mottled. Wings and tail white. In winter, plumage wholly white.

Identification: The size and white markings coupled with its habitat are sufficient to identify the Ptarmigan.

Occurrence: A bird of the high wind-swept ridges, the Ptarmigan prefers the region at and above timberline. Found entirely around the mountain.

Remarks: The exquisite heather bells, with the leaves of the little alpine buckwheat and other vegetation of the heights, furnish in summer an abundant supply of food. But during the winter, edible material must surely be hard to find about timberline and

Grouse of the High Country

Ptarmigan

Mother Ptarmigan with Chicks

Sooty Grouse

above. Perhaps it is only because there is little or no competition that they are able to subsist. In summer they keep close to the retreating snowbanks and often make their nests beside permanent ice fields. Their usual landscape is patched with snow as their plumage is with white. In winter they are entirely white. So perfectly do they blend with their surroundings at all times of the year that they are almost invisible when not moving. Tame and unsuspicious, the Ptarmigan is one of the most easily approached and studied of birds. Other typical inhabitants of its range are the Rosy Finch, the Hoary Marmot, and the White Goat. Its grace, beauty, and pleasing personal characteristics, coupled with the inspiring nature of its surroundings, make the Ptarmigan in its habitat perhaps the most interesting bird of the Park.

294. California Quail

(*Lophortyx californicus*)

Size: About the same size and shape as the common Bob-White Quail.

General Color: Crest, black; head, olive or brown with white lines. Upper parts, deep brown; throat, black; breast, bluish gray; belly, scaled. Female, duller.

Identification: The general quail-like appearance and the beautiful black plume worn as a crest mark the California Quail. No other quail occur in the Park.

Occurrence: Found only occasionally in the low valleys near the Park boundary. Particularly in the Nisqually valley on the south side.

Remarks: Although one of the most beautiful and attractive of birds, the California Quail lacks a strik-

ing call for which his eastern relative is loved. The conversational chatter of the covy is similar to the Bob-White's but the call notes are very different. Mrs. Bailey renders it, "Who are you ah" uttered quickly and not unpleasantly. The California Quail is native over much of the Pacific Coast region, but it has been introduced into Washington.

312. Band-Tailed Pigeon

(Columba fasciata)

Size: Very similar to the ordinary domesticated variety.

General Color: End of tail with gray band about two inches wide. Back of neck with white collar; head and under parts purplish pink fading to whitish on belly; back, bluish gray. Female, similar but duller.

Identification: The banded tail and the fact that there are no other pigeons in the Park identify the Band-Tailed Pigeon.

Occurrence: Found in isolated flocks in the river bottoms and lower meadows. Particularly common around the mineral springs at Longmire and Ohanapecosh Hot Springs.

Remarks: During the breeding season one sometimes is startled by the deep owl-like hooting of the male Pigeon which seems to fill the woods with its sound. In the evening of almost any day in the summer one may hear the loud flapping of wings as a flock of these interesting birds drop down the cliffs to their roosting place near Iron Mike spring at Longmire. The band on the tail appears white at a distance and is conspicuously seen as the birds wheel in the air or spread their tails in lighting. Outside the Park they

have been hunted for years and are in need of protection to save them from the fate of the Passenger Pigeon.

331. Marsh Hawk
(*Circus hudsonius*)

Size: A large hawk. Length 19 to 24 inches.

General Color: Body, bluish slate streaked with white. Pure white rump patch. Under parts lighter and faintly streaked with brown. Female, rusty and more or less streaked.

Identification: The owl-like facial ruff and large white rump patch are enough to distinguish the Marsh Hawk in any plumage.

Occurrence: Not uncommon about the meadows and alpine parks all over the reservation.

Remarks: Marsh Hawks seldom prey upon other birds but spend most of their time skimming low over the open areas searching for small rodents, frogs, and insects.

332. Sharp-Shinned Hawk
(*Accipiter velox*)

Size: A medium-sized hawk—length 10 to 14 inches.

General Color: Under parts white, barred or spotted with brown. Upper parts uniform bluish gray, tail with black bands and white tip. Female, similar but duller.

Identification: The small size and light under parts are good field marks.

Occurrence: Found only occasionally.

Remarks: The Sharp-shinned Hawk is among the most destructive of the falcons as he preys almost entirely upon other birds. Like the Marsh Hawk he hunts low but is more likely to frequent brushy areas rather than the open fields.

333. Cooper Hawk
(*Accipiter cooperii*)

Size: Medium large—14 to 17 inches in length.
General Color: Under parts, white, heavily barred with brown. Top of head, black; back, bluish gray. Female, similar but duller.
Identification: The Cooper Hawk resembles the Sharp-shinned but is larger, has rounded instead of square tail, and is not so light underneath.
Occurrence: Not abundant.
Remarks: The Cooper Hawk is very similar to the Sharp-shinned in habits and characteristics and is quite as destructive to bird life.

334a. Western Goshawk
(*Accipiter atricapillus striatulus*)

Size: A large hawk—about 22 inches in length.
General Color: Upper parts, dark bluish gray, almost sooty. Under parts, dark gray mottled with zigzag streaks. White line over eye.
Identification: The darker color, white line over eye, and larger size distinguish it from the Cooper or Sharp-shinned Hawks.
Occurrence: Not uncommon in the park.
Remarks: The Goshawks are without doubt the villains of the hawk tribe. They are largely responsible

for the fact that few chicks of the Sooty Grouse or Ptarmigan ever reach maturity intact.

337b. Western Red-Tailed Hawk
(*Buteo borealis calurus*)

Size: A large hawk—20 to 25 inches in length.

General Color: Varies greatly with individuals, from uniform sooty brown with reddish tail to buffy below and reddish brown above with bright reddish tail.

Identification: The Red-Tailed Hawk, as its name indicates, may be distinguished by its reddish tail with dim black bars.

Occurrence: Often found along rivers or on the edge of clearings. More often seen circling in the sky.

Remarks: The Red-Tailed Hawk lives principally on the different chipmunks and ground squirrels that are abundant in the Park.

342. Swainson Hawk
(*Buteo swainsoni*)

Size: A large Hawk—20 to 22 inches in length.

General Color: Normal color—throat and belly white with distinct reddish brown chest band. Upper parts uniform dark gray brown. Sometimes occurs in a very dark phase.

Identification: The reddish brown chest band is the field mark of the Swainson Hawk.

Occurrence: Often ranges over Park.

Remarks: The Swainson Hawk is eminently a prairie bird and is very abundant east of the mountains where it does a great deal of good by destroying destructive rodent pests.

349. Golden Eagle

(*Aquila chrysaëtos*)

Size: A large powerful bird—length 30 to 40 inches. Wing spread, about 7 feet.

General Color: Entire bird dark brown. Feathers of legs and back of neck lighter. Tail and wings darker.

Identification: The great size of the Golden Eagle and the proud bearing are marks of the eagles. The absence of a white head distinguishes the Golden from the adult Bald Eagle.

Occurrence: Ranges throughout the Park. Not numerous.

Remarks: Over the mountains and valleys the Golden Eagles, usually hunting in pairs, scour the ridges and sides of precipices for grouse and marmots, and when these become scarce or too wary from frequent raids, they descend to the dry plains east of the Cascades and beat the sagebrush for jackrabbits and ground squirrels, but the high mountains are their natural homes. Eagles may be seen almost daily swinging in great circles on poised wings high over the valleys. Usually, however, they are so far away that it is not possible to distinguish the Golden from the Bald Eagle which inhabits the same range.

352. Bald Eagle

(*Haliæëtus leucocephalus*)

Size: About the same size as the Golden Eagle. Length, 30 to 40 inches. Span, 7 to 8 feet.

General Color: Adult, head, neck, and tail white; rest of body dark brown. Immature birds do not have the white markings.

Identification: The white head and tail are field marks of the Bald Eagle.

Occurrence: Occasionally seen in the Park.

Remarks: The Bald Eagle, unfortunately, is at times both a scavenger and a robber and is not as worthy of the honor conferred upon him by the Government in being made the national emblem, as would be his cousin the Golden Eagle of more legitimate practices. The food of the Bald Eagle is largely fish, either caught by diving for them or stolen from other birds.

360a. Desert Sparrow Hawk

(*Falco sparverius deserticola*)

Size: The smallest of local hawks. Length, 9 to 12 inches.

General Color: Male—head slaty with rufus crown, and two side patches of black; back reddish, sometimes barred; under parts, buffy to white, sometimes spotted. Female—duller and more barred with dusky.

Identification: The small size, falcon-like actions, and comparatively bright colors are all marks of this beautiful little hawk.

Occurrence: Found everywhere in the Park, but preferring the alpine meadows.

Remarks: The Desert Sparrow Hawk is not only the most common but the most beautiful of the hawks native to the region. Its hovering flight and shrill "killy-killy-killy" are familiar sights and sounds in the Park. Much of its time is spent watching from a perch on a rock or dead tree rather than hunting on the wing. Frequently found around rockslides, it forces the little conies to play a desperate, unceasing game of hide-and-seek. Strange as it may seem for a

Santa Clara Coun
Free Library
San Jose, C

hawk, these spirited little falcons build their nests in knotholes and deserted woodpecker holes.

369a. Northern Spotted Owl

(*Syrnium occidentale caurinum*)

Size: A large owl about 19 inches in length.

General Color: Upper parts, brown with white spots. Under parts, lighter, barred and spotted with dusky. Tail, banded.

Identification: The spotted upper parts and the general dusky color are marks of the northern spotted owls. Distinguished from the Horned Owl by lack of ear tufts.

Occurrence: Quite abundant from the low valleys to the alpine meadows, preferring, however, the dark, lower slope forests.

Remarks: Although abundant, this large dusky owl is not often seen, being mainly nocturnal in habits. Occasionally as one walks along the forest trails, a dark shadowy object flits silently away through the tree-tops, seldom affording more than a fleeting view. So wary of civilization are they that little is known of the more intimate life of these silent night prowlers.

372a. Northwest Saw-Whet Owl

(*Nyctala acadica scotæa*)

Size: A small owl, 7 to 8 inches in length.

General Color: Upper parts, olive brown streaked with whitish. Under parts, buffy streaked heavily with brown. Feet and legs reddish.

Identification: The absence of ear tufts and the dark vertical striping distinguish this owl from the Screech Owl which is similar in size.

Occurrence: A bird of the dark forests, seldom seen but often heard. Probably more abundant than one would suppose.

Remarks: At night the Saw-Whet Owl floats on noiseless wings along the edges of the open parks and meadows, dropping on unsuspecting mice that rustle the grass or venture too far into the open, finding an abundance of food even when the snow lies deep and the nights are cold and crisp. Early in the spring its love songs may be heard for hours at a time, sometimes here, sometimes there, in the deep woods.

373. Screech Owl
(*Megascops asio*)

Size: A small owl—7 to 10 inches in length.

General Color: Either gray or reddish brown, always darker above and under parts with heavy shaft streaks and light cross lines of black.

Identification: The presence of conspicuous ear tufts differentiates this owl from the only other of its size, the Saw-Whet Owl.

Occurrence: Not uncommon particularly around the camps, hotels, and Ranger stations.

Remarks: Cats are not allowed in the National Park but a cat is not necessary around the buildings that the little Screech Owls adopt as their dwelling place. They are always on the lookout for small animals and are expert "mousers."

375c. Dusky Horned Owl
(*Bubo virginianus saturatus*)

Size: A large owl—20 to 25 inches in length.

General Color: The common Horned Owl is a bird of light buffy and yellowish tones but the variety which

inhabits the heavy west coast forests is very much darker, being largely dusky and dark gray.

Identification: The large size, dull colors, and conspicuous "horns" or ear tufts are field marks of the Dusky Horned Owl.

Occurrence: Throughout the forested regions of the Park. Not abundant.

Remarks: The Dusky Horned Owl is the largest of the owl family occurring in the Park and one of the most fierce and voracious of birds. Unlike their relative, the Northern Spotted Owl, which is more numerous, they are not entirely nocturnal, often hunting in broad daylight.

379a. California Pygmy Owl

(*Glaucidium gnoma californicum*)

Size: A very small owl only slightly longer than the English Sparrow but heavier.

General Color: Upper parts, dark brown. Under parts, light heavily streaked with dark brown. Chest washed with reddish brown.

Identification: The minute size of the Pygmy Owl is an unmistakable field mark.

Occurrence: Throughout the wooded sections of the Park. Not abundant.

Remarks: An elf-like little bird, with the face of an owl, the size of a thrush, and the flight of a falcon, is the California Pygmy Owl. Like other members of the family, it nests in cavities in trees, deserted woodpecker holes, and the like, but unlike other owls the Pygmy is mainly diurnal in habits, hunting in the bright sunlight or watching from the top of a stub apparently enjoying the warmth of the sun. In spite of their diminutive size these owls kill other birds and many

small mammals. Their calls resemble to some extent those of the Mourning Dove.

390. Belted Kingfisher
(*Ceryle alcyon*)

Size: Somewhat larger than a Robin—11 to 14 inches.

General Color: Under parts, white with blue gray belt across chest. Crest and upper parts bluish gray, white collar. Tail, black spotted with white.

Identification: The general blue-gray color, prominent crest, and ability as a fisherman identify the Belted Kingfisher.

Occurrence: Common along the trout streams and lakes of the Park.

Remarks: Kingfishers are expert fishermen. Since their food consists almost entirely of fish it behooves them to be expert at catching them. Wherever small fish may be found one may look for the blue-gray watcher perched on an overhanging dead branch or hovering in midair with spearlike beak ready to strike. Seldom does he fail to get his "limit" no matter whether fishing is good or bad.

Nests are built at the end of long burrows in the dirt bank of streams.

393c. Harris Woodpecker
(*Dryobates villosus harrisii*)

Size: About that of a Robin, 9 to 10 inches.

General Color: Upper parts black with scarlet nape, white stripe down back. Under parts, smoky gray. Female without red nape.

Identification: The larger size is the safest means of distinguishing the Harris from the Gairdner Woodpecker which is similar but two inches shorter.

Occurrence: Common throughout wooded area of the Park, preferring old burns.

Remarks: The Harris Woodpecker is the humid Pacific Coast form of the Hairy Woodpecker. Its food consists largely of wood-boring larvæ and beetles which it digs for in the dead trees.

394a. Gairdner Woodpecker

(*Dryobates pubescens gairdnerii*)

Size: Somewhat smaller than a Robin, 6 to 7 inches.

General Color: Similar to the Harris Woodpecker.

Identification: Distinguished from the Harris by the smaller size.

Occurrence: Common in brushy burned-over lands.

Remarks: The Gairdner Woodpecker is the Pacific Coast form of the Downy and resembles the Harris in appearance and habits. Like the Harris, he has the habit of drumming on dead limbs.

401a. Alaska Three-Toed Woodpecker

(*Picoides americanus fasciatus*)

Size: About that of a Robin.

General Color: Back and wings mostly black. Under parts, dingy white. Head with white stripes on side.

Identification: Similar to the Harris but without scarlet nape and with only three toes—two in front and one behind—rather than four.

Occurrence: Not abundant in the Park.

Remarks: The three-toed woodpeckers are birds of the spruce and fir forests and are not often seen. They

are persistent drummers, rattling away for minutes at a time on some dead limb, especially during the mating season in April.

403a. Northern Red-Breasted Sapsucker

(*Sphyrapicus ruber notkensis*)

Size: Slightly smaller than a Robin—8 to 9 inches.

General Color: Belly olive yellow. Head, neck, and chest plain red. Wings and tail black marked with white.

Identification: The dark red head, neck, and chest are prominent field marks of the Red-Breasted Sapsucker.

Occurrence: Sapsuckers are not often seen but judging from their work they are well distributed throughout the wooded areas of the Park.

Remarks: The small squarish holes so often noted drilled in rows around small cedar or alder trees are the work of the Red-Breasted Sapsuckers who thus manufacture flytraps from which later they gather a rich reward of insects attracted there by the flowing sap. On the trail just above Spray Falls is an alder, the bark of which is completely riddled by these holes and everywhere one finds small yellow cedars with many horizontal rows of holes almost girdling the tree. Apparently no damage is done other than to leave ridge-like scars where the growth of wood is abnormally stimulated by the pierced bark. Undoubtedly the Sapsuckers do a great deal of good by ridding the forests of destructive insect pests.

405a. Northern Pileated Woodpecker, Cock-of-the-Woods

(*Ceophlœus pileatus abieticola*)

Size: The largest of the woodpeckers—about 17 inches long.

General Color: Almost black, top of head and crest bright red, wide white strip on side of head and neck. White patches on wings. Crest brown rather than red in female.

Identification: The large size, conspicuous black and white markings, and prominent red crest are unmistakable marks of the Pileated Woodpecker.

Occurrence: Common in the heavy lower-slope forests such as those around Longmire Springs and the Park entrances.

Remarks: The loud ringing "chuck, chuck, chuck" of the Pileated is only occasionally heard in the lower valleys and one is fortunate to get a glimpse of this beautiful bird as he rapidly drills holes in dead stubs for his breakfast of ants and grubs. The large squarish nest cavities are often noted, however, along the trails, and these nests show the power of their owner more than the borings, for they are cut into the solid trunks of living trees. The cavity goes back for about six inches and then down for a foot and a half, and the large white eggs rest on a bed of fresh clean chips. The same tree is often used for several years but never the same hole. A fresh one is excavated each year and the old one left for the Saw-Whet Owls and the Flying Squirrels.

408. Lewis Woodpecker

(*Melanerpes torquatus*)

Size: About that of a Robin. Length—10 to 11 inches.

General Color: Upper parts iridescent greenish black with gray collar, face crimson, throat and chest gray changing to old rose on belly.

Identification: There can be no mistaking this black, gray, and red woodpecker.

Occurrence: A bird of the Transition Zone found throughout the forested sections of the Park.

Remarks: At a distance one may recognize the crowlike figure of the Lewis Woodpecker flying with sweeping, powerful strokes straight over the forests. His wide wings and short tail distinguish him from all other birds as far as he can be seen. They spend less time than most woodpeckers at manual labor, preferring to live upon ants, crickets, grasshoppers, seeds, and berries that can be secured near the ground with less effort.

413. Red-Shafted Flicker

(*Colaptes cafer collaris*)

Size: Somewhat larger than a Robin—12 to 14 inches long.

General Color: Head, nape, chin, and throat gray with brownish crown and forehead. Males with red mustaches; upper parts smoky brown with transverse black bars; under parts, lighter with numerous round black spots, and a shield of black on breast; wing and tail feathers red shafted; rump white; end of tail black.

Identification: The red shafted wing and tail feathers, and prominent white rump, distinguish the Flicker from any other Woodpecker in the Park.

Occurrence: Throughout the Park to timberline.

Remarks: Flickers are the noisiest, most conspicuous, most adaptable, most numerous, and most universally distributed woodpeckers in the Park. Without question, they prefer the tracts of "ghost" trees or dead stubs which are encountered at fairly

frequent intervals around the mountain; for here blueberries grow, wood-boring insects abound, and nesting sites are abundant in greatest numbers.

420a. Pacific Nighthawk

(*Chordeiles virginianus henryi*)

Size: Slightly longer than a Robin.

General Color: Barred and mottled white and sooty. White throat patch, wing bar, and tail band.

Identification: The batlike flight of the Nighthawk with its forked tail, sharp wings, and white markings are easy field marks.

Occurrence: Occasionally seen around clearings and meadows.

Remarks: The Pacific Nighthawk is a rare visitor to the higher areas of the Park. Around Longmire Springs it is seen of an evening catching insects batlike over the mineral springs. When winter comes these peculiar birds fly away to South America. Nighthawks do not build nests but lay their two speckled eggs on the ground.

424. Veaux Swift

(*Chætura veauxii*)

Size: Slightly smaller than a Swallow—length about 4 inches.

General Color: Upper parts sooty brown; under parts dark gray with light throat.

Identification: The dark color, sharp wings, and peculiar flight are marks of the Swift.

Occurrence: Found occasionally but not plentiful.

Remarks: The Swifts are dark, little birds, that hunt insects on the wing in company with the bats

and nighthawks. They usually feed in small flocks, rowing through the air like racers, twittering sociably as they go.

433. Rufous Hummingbird

(*Selasphorus rufus*)

Size: Considerably larger than the Ruby-Throated Hummer. Length, over 3 inches.

General Color: Throat, fire red, orange and green; body, bright reddish brown. Female, without conspicuous throat patch.

Identification: The large size and general reddish color are marks of the Rufous Hummer.

Occurrence: Very plentiful in the Park to timberline and somewhat above. Found inhabiting the open flower-covered fields.

Remarks: This big brown hummingbird is one of the characteristic inhabitants of the flower-filled meadows. Apparently it prefers red flowers, being especially active about clumps of Indian paintbrush, fireweed, tiger lilies, and columbine. Like the nests of most hummers, that of the Rufous is a work of art, daintily built of downy substances and decorated with lichens. Late in the summer it begins its long migration to southern Mexico.

436. Calliope Hummingbird

(*Stellula calliope*)

Size: A small Hummingbird. Length, under 3 inches.

General Color: Metallic green above, with purplish red throat patch, white belly, with reddish tinge on sides, wings, and tail.

Identification: The Calliope Hummer is not as abundant as the Rufous and may be distinguished by its smaller size, greenish back, and light under parts.

Occurrence: A bird of the high alpine meadows from heavy timber to above timberline.

Remarks: The favorite resorts of the Calliope Hummingbird are the open timbered areas found about the edges of the mountain meadows and the rocky hillsides where columbine, pentstemon, and bluebells bloom.

459. Olive-Sided Flycatcher

(*Contopus borealis*)

Size: Somewhat larger than the English Sparrow.

General Color: Upper parts sooty. Under parts, dark gray with white median line and olive tinge on sides.

Identification: The gray breast coupled with flycatcher actions are sufficient to distinguish the Olive-Sided Flycatcher.

Occurrence: A bird of the open forested belt from about 4,000 to 5,500 feet elevation.

Remarks: The Olive-Sided Flycatcher is a bird of solitary habits often noted perched in the tip of conifers watching for insect prey. It calls a great deal in the twilight and the mellow "pu-pip, pu-pu-pu" is one of the familiar sounds of the alpine parks.

464. Western Flycatcher

(*Empidonax difficilis*)

Size: About that of the English Sparrow.

General Color: Upper parts dark olive. Under parts, yellow, with brown shading across chest. Buffy wing bars.

Identification: The yellow under parts distinguish the Western Flycatcher from all others.

Occurrence: Found occasionally from the Park boundary to timberline. Prefers alder bottoms along streams and marshes.

Remarks: Like all other flycatchers, the western is adept at catching insects on the wing. From its perch it suddenly launches into the air, catches its insect, and with wings and tail spread sails back to its perch to await the coming of the next.

474a. Alaska Horned Lark

(*Otocoris alpestris arcticola*)

Size: About that of the English Sparrow.

General Color: Crown, horn-like tufts, cheeks, and shield on breast black. Throat white, back brownish streaked. Under parts whitish. White line over eye.

Identification: Horned larks may be known by the black horn-like tufts of feathers on the head.

Occurrence: Found during the winter only in small numbers inhabiting the open snow-covered meadows and bare ridges.

475. Black-Billed Magpie

(*Pica pica hudsonica*)

Size: As long but slightly smaller than a Crow.

General Color: Jet black except for white belly and wing patches.

Identification: There can be no mistaking this long-tailed black bird with conspicuous white markings which are very prominent in flight.

Occurrence: A bird of the hot dry plains east of the Cascades coming into the high meadows of the Park with the first snowstorms in September.

Remarks: When the snow lies many feet deep on the ground and other birds are rare, the magpies, together with the clarke nutcrackers and juncos are company for the hotel winter keepers and the Rangers at outlying stations, who take great pleasure in feeding them and watching them play practical jokes on each other. With the melting of the snow the magpies return to the sagebrush country and the fringe of cottonwoods along the streams where they build their bulky nests.

478. Steller Jay
(*Cyanocitta stelleri*)

Size: Somewhat larger than a Robin.

General Color: Head and crest black; back, blue-gray; otherwise, bright blue.

Identification: There can be no mistaking this brilliantly colored bird with its prominent crest and impudent bearing. There are no other bluejays in the region.

Occurrence: Well distributed throughout the forest regions of the Park. Prefers the vicinity of hotels and camps.

Remarks: The bold Steller Jay is fond of human society, or rather the good pickings that go with it, and inhabits the lower automobile camps such as that at Longmire Springs, in large numbers. He is more or less omnivorous as to diet, loquacious of temperament, and alternately bold and shy. He comports himself with much dignity, and the appearance of respectability and worldly wisdom, but is something of a villain in spite of that, for it is well known that he is not averse to eating the eggs and breaking up the homes of smaller birds. Late in the summer and early in

Steller Jay

Water Ouzel or Dipper

(Photographs by L. D. Lindsley)

the spring there is a vertical migration and for a short time the birds are common in the high parks just below timberline.

485a. Gray Jay, Camp Robber

(*Perisoreus obscurus griseus*)

Size: About that of a Robin.

General Color: Gray above, whitish beneath; top of head dark brown; face mostly white.

Identification: The grayish coloration of the back, combined with the blackish head and light under parts, serve to distinguish this bird. If these were not sufficient, its extraordinary habits would at once identify it as a Camp Robber.

Occurrence: Throughout the forested areas of the Park. Uncommon in the high meadows during the summer.

Remarks: Less shy than any other bird in the Park, the Gray Jay does not hesitate to invade one's camp and appropriate tasty morsels of butter, meat, or other foods from the very plate from which one is eating if permitted to take such liberties. The writer once saw two jays light upon the aimed gun of a Ranger about to fire at a mark. Even the crack of the pistol did not greatly frighten them although they were unaccustomed to it. On another occasion, one was seen carrying away a dead mouse in its beak. Evidently the load was too far foward to balance well for without hesitating, the jay dropped it from the bill, caught it deftly with the feet, and proceeded in its flight.

The vocal versatility shown by the bird, his talkative and inquisitive nature, his occurrence in heavy timber where other birds are scarce, his informal manner of dropping in on one's camp, his extraordinary freedom

from shyness, and his comical struggles with food fragments too large to be carried away readily, all contribute to one's affectionate interest in the Gray Jay, and serve to establish his reputation as one of the Park's most interesting and well-known bird citizens. Little is known of its intimate home life.

486. American Raven

(*Corvus corax sinuatus*)

Size: Somewhat larger than a Crow. Length, 21 to 26 inches.

General Color: Entirely black, plumage glossed with purplish tinge; grayish tinge at neck.

Identification: Their larger size and hoarse croaks distinguish the ravens from the crows.

Occurrence: Common throughout the forested areas of the Park preferring the lower river valleys.

Remarks: Residents at Longmire become accustomed to the coarse croaking of the ravens as early each morning they fly from their nesting and roosting ground on Rampart Ridge to the broad bars of the Nisqually for the day's hunting. Again at dusk they are heard returning to the cliffs. Suspicious, wary pirates they are, always on the alert to prevent being robbed of their spoils or to avoid the mobbing attacks of smaller birds that seem to have permanent wrongs to avenge. Their nests are placed in a niche halfway up some perpendicular cliff where they bid defiance to all enemies.

489. Northwest Crow

(*Corvus caurinus*)

Size: Slightly smaller than the common Crow. Length, 16 to 17 inches.

General Color: Black, upper parts glossed with dull violet.

Identification: This is the only crow in the Park. He is decidedly smaller than the raven.

Occurrence: Common throughout the Park up to timberline. Prefers the river valleys.

Remarks: The Northwest Crow is less suspicious and shy than the common Crow. Perhaps it is because he has suffered less at the hand of man, for the Crow is considered a valuable bird in the Northwest because of his good offices as a scavenger.

491. Clarke Crow, Nutcracker
(*Nucifraga columbiana*)

Size: Considerably larger than a Robin. Length, 12 to 13 inches.

General Color: Body plumage, gray; wings, black bordered with white. Tail, black above with white margins; white beneath.

Identification: The gray body plumage with conspicuous white and black markings serve to distinguish the Clarke Crow.

Occurrence: Found at high altitudes (from 5,000 feet to well above timberline) on the south, east, and north sides of the Park. Rare on the west side.

Remarks: The Nutcracker is the typical bird of the high alpine parks, being particularly abundant throughout the year around the camps and hotel at Paradise Valley. Nutcrackers are omnivorous feeders and rather secretive nesters. They are equally at home on the ground or in the tall conifers. Often they become quite bold, raiding camps and carrying off what eatables are available. Around the hotels they attract a great deal of attention by their loud "kar'r'r's" and swift

flight. During the winter they become quite tame if fed and do not hesitate to enter at the open window and take food from the table, which they carry to the dense branches of a nearby fir to eat at leisure.

501b. Western Meadowlark

(*Sturnella magna neglecta*)

Size: About that of a Robin.

General Color: Upper parts, grayish brown with buffy and black streaks and bars. Under parts, bright yellow with black crescent on chest and black spots on sides. White line over eye.

Identification: The yellow breast with black crescent patch are conspicuous marks of the Meadowlarks.

Occurrence: Found only rarely in the lower meadows of the Park.

Remarks: The song of the Western Meadowlark is one of the most delightful of those heard in the Park. Unfortunately these splendid birds find few areas suitable to their mode of life and are not often seen.

510. Brewer Blackbird

(*Scolecophagus cyanocephalus*)

Size: About that of a Robin.

General Color: Glossy greenish black, head and neck purplish black. Female—duller.

Identification: This is the only Blackbird that occurs in the Park.

Occurrence: Individuals and small groups found occasionally throughout the Park to timberline.

Remarks: For some unknown reasons the Brewer Blackbirds, in small numbers, inhabit Glacier Basin on the north side of the mountain at an elevation of 5,900

Two Typical Park Birds

Gray Jay or Camp Robber

Nutcracker or Clark Crow

feet, being seen around Starbo Camp until the fall snowstorms. They are occasionally found in other sections of the Park but rarely if ever seen at a similar elevation.

514a. Western Evening Grosbeak

(*Coccothraustes vespertinus montanus*)

Size: About that of the English Sparrow.

General Color: Male—forehead, bright yellow; crown, wings, and tail, black; wings with large white patches; rest of upper parts olive to yellow. Under parts, greenish yellow to bright yellow under wings. Female—largely yellowish or yellowish brown, white patches on wing conspicuous.

Identification: Field marks of the Evening Grosbeaks are the heavy beak, greenish yellow color with black wings and tail and white wing spots. The yellow foreheads of the males are conspicuous.

Occurrence: Sometimes seen late in the summer in small bands wandering over the forests. Not common.

518. Cassin Purple Finch

(*Carpodacus cassini*)

Size: About that of the English Sparrow.

General Color: Males—squarish patch of bright crimson on top of head; back dull pinkish brown streaked with dark brown. Under parts pale pink fading to white on belly. Female—whole body sharply streaked with dusky; ground color of upper parts olive-gray; under parts, white.

Identification: The bright crimson crown patch and plain under parts are easy field marks of the males.

Occurrence: Not uncommon in the Park.

Remarks: The Cassin Finch is a bird of the mountains, breeding from the lower edge of the firs to timberline, where its sweet song gains richness from its inspiring setting.

521. American Crossbill

(*Loxia curvirostra minor*)

Size: About that of the English Sparrow.

General Color: Male—dull red, gray showing through on under parts, indistinct streaks on back; wings and tail plain dusky. Female—olive often shading to bright yellow.

Identification: The crossed mandibles used for opening cones and the uniform reddish or yellow color with dark tail and wings are marks of the Crossbill.

Occurrence: Crossbills are very irregular in their visits, going and coming with the cones. Flocks appear for a time in the fall when the coniferous trees are heavy with fruit but in years when the crop of cones is light they are never seen.

522. White-Winged Crossbill

(*Loxia leucoptera*)

Size: About that of the English Sparrow.

General Color: Male—dull rose red with dusky wings and tail. Female—olive-green to gray. Wings of both with two white bands.

Identification: In appearance the White-Winged is very similar to the American Crossbill but they may be distinguished readily by the white wing bars.

Occurrence: Rarely seen.

Remarks: In habits and characteristics the White-Winged Crossbill resembles the American. Both de-

pend largely upon the seeds of conifers for their food and are adept at removing them from the cones.

524a. Hepburn Leucosticte, Rosy Finch
(*Leucosticte tephrocotis littoralis*)

Size: About that of an English Sparrow.

General Color: Brown above and below, with rosy color along flanks and on margins of wing feathers. Black frontal patch, rest of head and face gray.

Identification: The Pipit is the only other bird of a similar size occurring in the Leucosticte's habitat. The darker color alone of the latter would usually distinguish it from the Pipit; the Leucosticte lacks the white markings on the tail possessed by the Pipit, and also the teeter-tail habit so conspicuous in the Pipit. The bearing of the birds is different, the Leucosticte being a sparrow, the Pipit a wagtail.

Occurrence: Common on the wind-swept ridges and moraines of the glaciers and permanent snow fields from below timberline, 6,000 feet, to the altitude of Camp Muir, 10,000 feet, and above.

Remarks: Individuals or pairs of this hardy bird mountaineer can quite certainly be found if one has the persistence to climb to its habitat. Apparently scorning more comfortable surroundings, the Rosy Finch selects for its home and feeding ground bleak and wind-swept ridges of rock, and dizzy crags and precipices, and the great snow fields and glaciers where seeds and insects are carried by the high winds and kept in cold storage for the birds. It is not hard to understand why very few nests have ever been found. In the fall the birds gather in considerable flocks and descend to lower altitudes. Other characteristic birds and animals of the Rosy Finches' range

are the Pipit, the Ptarmigan, and the White Mountain Goats.

533. Pine Siskin, Pine Finch

(*Spinus pinus*)

Size: Of a Goldfinch. Length, about 4 inches.
General Color: Above grayish or brownish; rump paler; below dull yellow streaked with dusky both above and below. Two white wing bars. Yellow base to wing and tail feathers.
Identification: The Siskin is easily recognized in the field as the yellow wing and tail patches and white wing bars show in flight.
Occurrence: Found throughout the Park to altitudes far above timberline.
Remarks: This Goldfinch of the heights is an attractive little creature both in his dress and his personality. Of an exceedingly sociable disposition, he apparently regrets the necessity of giving up the flocking habit even for the nesting period, and as soon as possible he gathers with his relatives, friends, and acquaintances into considerable companies. These flocks, made up sometimes of as many as 200 individuals, may be seen feeding on heather banks, snow fields, alpine firs, or even about the doors of the hotels and camps, continually circling and wheeling as they seek their food, conversing amicably in the pleasing Siskin language as they industriously work and play together.

534. Snowflake

(*Passerina nivalis*)

Size: About that of the English Sparrow.
General Color: White and black. In winter upper parts washed with rusty brown.

Identification: There can be no mistaking these conspicuous white and black visitors from the Arctic.

Occurrence: Noted only once in the Park. With the coming of the first snow late in September, 1924, a large flock, numbering several hundred, was found feeding on Mount Ararat in Indian Henry's Hunting Ground, elevation 5,500 feet. These hardy sparrows come to the northern states only in the winter. During the summer they go as far north as the pole and are always noted by Arctic expeditions.

542b. Western Savanna Sparrow

(*Ammodramas sandwichensis alaudinus*)

Size: Somewhat smaller than the English Sparrow.

General Color: Upper parts dark gray heavily streaked with black. Under parts white. White or yellow stripe over eye. Medial crown stripe.

Identification: The heavy black striping on the back and the three stripes on head are field marks of the Savanna Sparrow.

Occurrence: Occasionally noted inhabiting the lower clearings, river bars, and brush-grown burns.

554a. Gambel Sparrow

(*Zonotrichia leucophrys gambelii*)

Size: About that of the English Sparrow.

General Color: Top and sides of head striped black and white. Heavy white medial stripe. Edge of wing white; under parts plain gray; back with fore part gray with black stripes; rump brown.

Identification: The large size and distinct white crown stripe are field marks of the Gambel Sparrow.

Occurrence: Common about all the lower meadows, clearings, and large river bars.

Remarks: The Gambel Sparrow is the White-Crowned Sparrow of the mountain where he successfully upholds the White-Crown's splendid reputation as a songster.

557. Golden-Crowned Sparrow

(Zonotrichia coronata)

Size: About that of an English Sparrow.

General Color: Yellow crown enclosed in black. Upper parts olive-brown streaked with blackish brown. Under parts gray, sides washed with brown and two white wing bands.

Identification: The yellow patch on the crown coupled with the general sparrow-like appearance are sufficient to identify the Golden-Crowned Sparrow.

Occurrence: Found associating with the Gambel Sparrows in the lower valleys of the Park. Their song and general habits are similar.

560a. Western Chipping Sparrow

(Spizella socialis arizonæ)

Size: Somewhat smaller than the English Sparrow.

General Color: Top of head rufous, forehead white, black line through eye. Back buffy, streaked with black. Under parts ashy.

Identification: The small size, rufous crown and black eye stripe are field marks of the Chipping Sparrow.

Occurrence: Found on the edge of the woods and about openings in the forests of the lower valleys where insects and seeds are abundant.

567a. Oregon Junco

(*Junco hyemalis oregonus*)

Size: Slightly smaller than the English Sparrow.

General Color: Head, throat, and breast black. Middle of back dark brown. Sides pinkish brown; belly white; wings and tail dusky; tail edged with white.

Identification: No other birds can be mistaken for the black-hooded, brown-backed, and white-bellied snowbirds. The white outer tail feathers are conspicuous in flight.

Occurrence: Throughout the Park from the lowest altitudes to timberline and above.

Remarks: The trilled song of the Oregon Junco is at least as likely to be heard in the gnarled firs at timberline as any other sound. In this bleak region it is cheering and delightful. During the long white winters the juncos are welcome guests at every hotel and Ranger station in the Park. Nests have been found in Oregon grape and salal on Tahoma Creek as early as April, and in Paradise Valley as late as August.

567b. Intermediate or Shufeldt Junco

(*Junco hyemelis connectens*)

Remarks: The Shufeldt Junco is very similar in appearance and habits to the Oregon Junco and the two mingle together over all their range.

581e. Rusty Song Sparrow

(*Melospiza melodia morphna*)

Size: About that of the English Sparrow.

General Color: Upper parts rusty olive; chest widely marked with heavy brown streaks; flanks

olivaceous; dim medial stripe and white lines over eyes.

Identification: This is the Song Sparrow of the Park. He may be known by his characteristic song and dark brown colors.

Occurrence: Abundant in all open areas of the lower valleys. Particularly common about the mineral springs at Longmire.

Remarks: The Rusty Song Sparrow is not a great or showy musician, but a singer of songs, plain every-day home songs with the heart left in them. No bird song is more familiar about Longmire Springs than that of the Song Sparrow.

583. Lincoln Sparrow

(*Melospiza lincolnii*)

Size: Slightly smaller than the English Sparrow.

General Color: Upper parts dark brown and olive finely streaked with black. Crown with light median line. Sides and chest buffy with narrow black stripes.

Identification: The Lincoln Sparrow might be mistaken for a Song Sparrow but for his buffy chest band with its fine penciling and his wholly individual vibrant song.

Occurrence: Found in the lower valleys, preferring willow thickets and the brushy edges of the forest.

585. Fox Sparrow

(*Passerella iliaca*)

Size: About that of an English Sparrow.

General Color: Upper parts mixed with strongly contrasting slate gray and reddish brown. Brown brightest on wings, rump, and tail. Two white wing

bars. Under parts white, chest spotted with reddish brown.

Identification: The large size and dark reddish color of wings and tail are field marks of the Fox Sparrows.

Occurrence: Found occasionally in the lower valleys particularly about marshy areas such as those below National Park Inn at Longmire.

588b. Oregon Towhee

(Pipilo maculatus oregonus)

Size: Slightly smaller than a Robin.

General Color: Upper parts black or sooty black. Head and chest black. Sides dark rufous; belly white.

Identification: The size, black head, neck, and chest, and bright rufous sides are easy field marks of the Oregon Towhee.

Occurrence: A bird of the woods and wooded parks, occasionally found up to timberline. Not abundant.

Remarks: A few years ago one of the summit guides brought down an Oregon Towhee that had been found dead on the snow dome, 13,000 feet above sea level. Whether the bird became lost in a storm and fell exhausted in the snow, or whether carried and dropped there by a hawk, is not known. Hawks are occasionally seen circling the summit (14,408 feet).

596. Black-Headed Grosbeak

(Zamelodia melanocephala)

Size: Somewhat larger than the English Sparrow.

General Color: Under parts cinnamon brown brightening to lemon yellow on belly and under wings. Upper parts largely black with brown collar and rump. Two white wing bars. Female, duller.

Occurrence: Occasionally noted in the lower valleys, preferring the vicinity of buildings.

607. Western Tanager

(Piranga ludoviciana)

Size: Somewhat larger than the English Sparrow.

General Color: Male—head and neck bright orange or red, rest of under parts bright yellow; upper parts black with yellow rump and wing patches. Female—much duller, largely olive gray above and gray to yellow below.

Identification: There can be no mistaking this bird. There are no others in the Park so brilliantly colored.

Occurrence: Found throughout the wooded sections of the Park but not plentiful. About Longmire Springs one sees or hears individual tanagers now and then but usually a flash of red and yellow between the trees is all one is allowed.

614. Tree Swallow

(Tachycineta bicolor)

Size: About that of a small Sparrow. Length, 5 to 6 inches.

General Color: Under parts pure white; upper parts burnished steel blue. Head, wings, and tail darker. Female, sometimes duller.

Identification: The forked tail, sharp wings, and swallow-like flight marks the *bicolor* as a swallow at once. The steel blue back, black head, and pure white breast distinguish it from the violet-green back of the only other swallow occurring in the region.

Occurrence: Often noted on warm summer evenings skimming low over the surface of the larger lakes. Not abundant in the Park, however.

615. Northern Violet-Green Swallow

(*Tachycineta thalassina lepida*)

Size: Slightly smaller than an English Sparrow.

General Color: Top of head parrot green, narrow purple collar, back bottle green glossed with violet, rump violet to purple. Female similar but duller.

Identification: The bright green head serves to mark the Violet-Green Swallow.

Occurrence: Habits, characteristics, and range similar to those of the Tree Swallow.

619. Cedar Waxwing

(*Ampelis cedrorum*)

Size: Midway between that of a Sparrow and a Robin.

General Color: Velvety black streak through eye, crest, head, and entire body fawn color; darker above; wings and tail dark gray sometimes tipped with red waxlike appendages; tip of tail yellow.

Identification: The smooth plump fawn-colored body with yellow tip to tail and saucily held crest are identification marks of the Cedar Waxwings.

Occurrence: Early in the summer an occasional flock of these friendly little birds may appear and stay for a few days in the lower valleys of the Park but they are erratic wanderers and the next season may not be seen at all.

622a. White-Rumped Shrikes

(*Lanius ludovicianus excubitorides*)

Size: About that of the Robin.

General Color: Upper parts light slate gray; under parts pure white. Heavy beak and lores black.

Identification: Shrikes may be recognized by their level flight, short wings, generally gray color, and heavy hooked bill.

Occurrence: Noted only rarely in the Park.

Remarks: Shrikes are miniature birds of prey, living upon large insects and small birds which they have the peculiar habit of impaling on thorns for future reference.

627. Warbling Vireo

(*Vireo gilvus*)

Size: About that of a Goldfinch. Length, about 5 inches.

General Color: Upper parts olive gray; grayest on head and most olive on rump; white streak through eye; wings and tail dusky brown; under parts white shaded with olive yellow on sides.

Identification: This is the only vireo listed in the Park. He may be known by his lack of distinguishing marks. A colorless little bird but with a wonderful little song.

Occurrence: The Western Warbling Vireo is a bird of the mountains and forests but only an occasional visitor to the Park.

646a. Lutescent Warbler

(*Helminthophila celata lutescens*)

Size: About that of a House Wren.

General Color: Upper parts bright olive green; under parts bright greenish yellow with olive green streaks.

Identification: The greenish yellow breast with darker streaks is a good field mark of this tiny little warbler.

Occurrence: The Lutescent Warbler occasionally nests among the ferns and brackens of the lower valleys but is more often seen in small flocks during the spring migration.

652. Yellow Warbler

(*Dendroica æstiva*)

Size: A large warbler about the size of a Goldfinch.

General Color: Under parts bright yellow streaked on breast with reddish; forehead bright yellow; rest of head and upper parts yellowish green. Wings, darker.

Identification: The only other brilliant yellow bird found in the region is the Pileolated Warbler which has a black crown patch and does not have the reddish lines on the chest.

Occurrence: Early in the summer it is not uncommon to have a flock of these cheerful little yellow birds drop in on the Park for a few days during the spring migration. They have so much singing to do and so many insects to catch that it keeps them very busy.

656. Audubon Warbler

(*Dendroica auduboni*)

Size: About that of the Goldfinch.

General Color: Summer, throat, crown, and rump patches bright yellow. Under parts, white, yellow, and black; upper parts bluish gray streaked with black. Wings and tail darker with white patches. Winter plumage, duller.

Identification: The yellow throat and rump patches are the distinguishing marks of the Audubon Warblers.

Occurrence: Nests in the lower valleys and meadows. Fairly plentiful in the Park.

668. Townsend Warbler

(Dendroica townsendi)

Size: A small warbler about the size of a Wren.

General Color: Head and throat black with two yellow streaks on side; breast bright yellow; sides streaked with black; back bright olive green with black points; wings and tail blackish. Wings with two white bars.

Identification: The black eye patch is the field mark of the Townsend Warbler.

Occurrence: Not uncommon in the lower valleys during the spring migration but a difficult bird to study because it feeds in the top of the tall trees.

669. Tolmie Warbler

(Dendroica occidentalis)

Size: About that of a large Wren.

General Color: The Tolmie Warbler is similar to the Townsend Warbler but does not have the black eye patch having a yellow-sided head instead.

685a. Pileolated Warbler

(Wilsonia pusilla pileolata

Size: A large warbler about the size of a Goldfinch.

General Color: Back yellowish olive; under parts vivid yellow. Glossy blue-black crown patch. Wings and tail darker.

Identification: The black crown patch distinguishes the Pileolated Warbler from the Yellow Warbler.

Occurrence: Abundant in the lower valleys, along rivers and meadows early in the summer. Occasionally nesting in the Park.

Remarks: The Pileolated Warbler is one of the most common warblers found in the Park and because of his habit of hunting low through the shrubs and lower limbs is often seen and easily studied. Like most of the warblers he has a cheery pleasant song.

697. Pipit

(*Anthus pensilvanicus*)

Size: About that of an English Sparrow.

General Color: Gray above, whitish washed with buffy beneath; breast more or less streaked lengthwise with dusky.

Identification: In the field this bird appears dark above and buffy-whitish beneath. The more or less lengthwise streaking on the breast is apparent also. The tail appears brownish with white edges. At intervals the bird tips up its tail in a characteristic manner.

Occurrence: From the alpine meadows to the altitude of Camp Muir (10,000 feet) and somewhat above.

Remarks: With the Rosy Finch and Pine Siskin, the Pipit holds the altitude record of birds in the Park. Grassy patches above timberline are apparently preferred for nest sites. Often one will encounter this bird cheerfully teetering and calling on storm-swept rock ledges or pumice slopes from hundreds to thousands of feet above the last drawfed and matted trees.

701. Water Ouzel, Dipper

(*Cinclus mexicanus*)

Size: Somewhat larger than an English Sparrow.

General Color: Uniform slaty gray.

Identification: No other bird can be confused with the modestly dressed Dipper, with its bob-tail, its

pretty habit of courtseying, and its passion for turbulent streams and waterfalls.

Occurrence: Along streams and above lakes from the Park boundaries to 6,000 feet altitude or timberline.

Remarks: As is well known, the Water Ouzel has the extraordinary habit of nesting beneath waterfalls where it builds a home of living moss which is kept green by the spray. The Paradise River, with its countless cascades and waterfalls, is a favorite stretch of water, but one is very apt to meet the bird on any of the streams of the Park. It is quite as often seen swinging low over the water near the shore of Mowich or Reflection Lakes or perched on stones at the edge of the small, high-altitude ponds, apparently as much at home as on the cascading creeks below. Its beautiful wrenlike song is full of rich notes, and is wonderfully attractive in the wild surroundings in which the Ouzel is usually found. Sometimes it is heard along the snow-covered streams in the still of winter.

721a. Parkman Wren, Pacific House Wren

(*Troglodytes aëdon parkmanii*)

Size: About that of the ordinary House Wren. Length 4 to 5 inches.

General Color: Upper parts, dull brown barred with darker. Under parts, dingy, lightly barred.

Identification: The Parkman Wren lacks the white line over the eye of the Bewick which is also present, though less distinct, on the only other member of the family found in the Park, the Western Winter Wren.

Occurrence: Not abundant in the Park. Occasionally found about deserted cabins or other buildings in the lower valleys.

719e. Northwest Bewick Wren

(*Thryomanes bewickii calophonus*)

Size: About that of the Common House Wren.

General Color: White line over eye. Upper parts rich dark brown, slightly deeper on head; tail, black. Under parts grayish white, lighter on throat.

Identification: The distinct white line over the eye is the mark of all the Bewick Wrens.

Occurrence: Not common in the Park.

722a. Western Winter Wren

(*Olbiorchilus hiemalis pacificus*)

Size: About that of a House Wren.

General Color: Dark brown above, lighter beneath. Indistinctly barred with blackish. Tawny line over eye not conspicuous.

Identification: The small size, deep-brown color, absence of conspicuous line over the eye, and ground-loving habits of this diminutive resident of the deep woods make identification easy.

Occurrence: Abundant from the Park boundaries nearly to the limit of trees.

Remarks: This bird seems as much a part of the shadowy forest floor as the mosses, ferns, huge logs, and upturned roots of its surroundings. Ordinarily the wren does not venture higher than 6 feet above the ground, but is wont suddenly to issue from beneath a huge mossy windfall quite close to the observer and give his usual command to "chek-chek, chek-chek." Aside from these he possesses a tiny tinkling song which is one of the most often heard and attractive features of the heavy dark woods. In winter, when all the trees are trimmed in ermine, the song of the

wren is particularly pleasing as it is the only bird song heard in the forests.

If approached, he dodges back under the log, or slips silently away in some handy root tangle. Food, nesting site, and approved living conditions all are furnished in abundance by his forest-floor habitat.

726c. Tawny Creeper

(Certhia familiaris occidentalis)

Size: About that of a Wren.

General Color: Upper parts rusty brown; under parts and streaks on head and back grayish.

Identification: The long curved bill, slender body, and characteristic Creeper habits of searching the bark of trees from the base up for insect eggs and larvæ are sufficient to identify this bird which is the only Creeper listed in the Park.

Occurrence: Throughout the forested areas of the Park. Often noted about Longmire Springs, particularly during the late summer and fall.

727a. Slender-Billed Nuthatch

(Sitta carolinensis oculeata)

Size: Somewhat larger than a Wren.

General Color: Male—top of head and back of neck glossy blue-black in sharp contrast to the clear white of sides of head and under parts; back bluish gray; wings and tail marked with black and white. Female—top of head grayish.

Identification: The Slender-Billed Nuthatch may be distinguished from the Red-Breasted by the absence of the black eye stripe and the reddish breast. These are the only two occurring in the Park.

Occurrence: Well distributed throughout the forested sections of the Park.

728. Red-Breasted Nuthatch

(Sitta canadensis)

Size: Somewhat larger than a Wren.

General Color: Top of head glossy black, side of head with white superciliary and black eye stripe. Under parts, reddish brown. Back, wings, and tail bluish gray.

Identification: Nuthatches are readily recognized by their contrasting colors and peculiar habits of searching for food on the trunk of trees as often head downward as otherwise. The Red-Breasted is immediately distinguished from the Slender-Billed with which it is often associated by the reddish under parts and black eye stripe.

Occurrence: Found throughout the wooded areas of the Park.

Remarks: As you go along the roads or woodsy trails of the Park the unmistakable "yank, yank, henk-ah, henk-ah," are frequently heard, together with the notes of the Kinglets, Mountain Chickadees, and Audubon Warblers, for the Nuthatches are sociable little creatures and their flocks often join the ranks of other small foresters.

735b. Oregon Chickadee

(Parus atricapillus occidentalis)

Size: Somewhat larger than a Wren.

General Color: Top of head and back of neck jet black; back dark gray; sides of head white; under parts white with reddish brown sides; black throat patch.

Identification: There are three Chickadees common in the Park. The Oregon Chickadee may be known by the absence of a black eye stripe coupled with a gray back.

Occurrence: Common the year around from the boundaries to timberline.

738. Mountain Chickadee

(Parus gambeli)

Size: Somewhat larger than a Wren.

General Color: Very similar to the Oregon Chickadee except for black line through eye.

Occurrence: Well distributed throughout the forested sections of the Park.

741. Chestnut-Backed Chickadee

(Parus rufescens)

Size: Somewhat larger than a Wren.

General Color: Throat blackish brown; top of head and back of neck brown; back, sides, and flanks chestnut brown; rest of under parts and side of head white.

Identification: The Chestnut-Backed is readily distinguished from other Chickadees by the brown instead of black head markings and reddish brown back and sides.

Occurrence: Found throughout the Park to timberline but not so abundant as the Oregon and Mountain Chickadees.

Remarks: The song of the Chickadees is among the most common heard in the woods of the Park. They are fascinating little folk to study, full of energy and with the appearance of a great deal of intelligence. In the early spring and late fall Chickadees are found

in small bands systematically working through the forests. They move from tree to tree in short tilting flights, and cling upside down to the tips of the branches while their bright, beady eyes search for insect food. As one traverses the silent woods on snowshoes or skis during the winter and meets with these tiny birds he feels that here are old friends unsuspicious and always ready with a cheery word. On wet, rainy days, the Chestnut-Backed Chickadees are particularly active in their search for insect food.

748a. Western Golden-Crowned Kinglet

(Regulus satrapa olivaceus)

Size: About that of a Wren.

General Color: Crown patch of bright yellow encircled with black; rest of upper parts olive green; wings with two white bands; under parts whitish washed with buffy brown. Crown patch of young is wanting but there is a white line over the eye.

Identification: The quick movements and continual "ti-ti-ti-ti-ti" as a flock of these plump little birds work through the trees examining each twig microscopically for insect food, mark them immediately as Kinglets and the golden crown patch tells the rest.

Occurrence: Present in the lower valleys in large numbers during the fall migration.

749. Ruby-Crowned Kinglet

(Regulus calendula)

Size: About that of a Wren.

General Color: Similar to the Golden-Crowned except crown patch bright red and back grayer.

Identification: The red instead of yellow crown patch is the distinguishing field mark between the two Kinglets.

Occurrence: Present in large flocks throughout the late summer and fall.

Remarks: It is always a red-letter day when the twitter in the treetops announces that the Kinglets are back. The scolding chatter of these plump little fellows accompanied by a lift of the wings, however far overhead, always tells an unmistakable tale. The cheery, busy little chap brings his own welcome to the timber, but when he sings you regard him with a new feeling of wondering admiration—such a volume of song and such a well-modulated, liquid, ringing melody.

754. Townsend Solitaire

(Myadestes townsendi)

Size: Somewhat smaller than a Robin. Length, 7 to 9 inches.

General Color: Brownish gray, paler beneath; two grayish white wing bars; outer tail feathers grayish white. Young spotted with buffy.

Identification: The Townsend Solitaire may be known by its robin-like actions and rather uniform dark gray color with whitish wing bars and outer tail feathers.

Occurrence: Occasionally found from the upper edge of the heavy forests to timberline. A bird of the high alpine meadows and rocky crags.

Remarks: Strange, shy birds, these relatives of the robins and thrushes that have adopted the high alpine country as their home. They are perhaps more numerous than is supposed, their demure solitary ways,

coupled with the isolation of their range, rendering them inconspicuous. The song of the Solitaire when given freely, rings out with a strong, clear, flavor all its own, somewhat thrushlike in character but different.

758. Russet-Backed Thrush
(*Hylocichla usulata*)

Size: Somewhat smaller than a Robin.

General Color: Upper parts olive brown; wings and tail darker; buffy ring about eye. Chest buffy, marked with small triangular brown spots; belly white.

Identification: The lighter color and buff eye ring distinguish the Russet-Backed from the Hermit Thrush.

Occurrence: Abundant about the small openings in the lower woods throughout the summer.

759. Alaska Hermit Thrush
(*Hylocichla guttata*)

Size: Considerably smaller than the Robin. Length, 6 to 7 inches.

General Color: Upper parts dark grayish brown; tail deep rufous; chest thickly marked with broad wedge-shaped spots.

Identification: The Hermit Thrush is readily distinguished from the Russet-Backed by the deep reddish tail, heavier breast spots, and absence of eye ring.

Occurrence: Found occasionally in the lower valleys during the summer inhabiting the river bars, small meadows, and the edges of the forest.

Remarks: The Hermit Thrushes have a marked habit of raising and lowering their reddish tails, and

their call note is a single "chuck." As a group their songs rank as the best of the rare thrush songs.

761. Western Robin

(Merula migratoria propinqua)

Size: That of the Eastern Robin.

General Color: Very similar in appearance and habits to the eastern variety. Head, wings, and tail blackish, rest of upper parts slaty gray; throat black streaked with white; rest of under parts, except tail coverts, rufous. Young, duller with under parts spotted.

Identification: No one will fail to recognize the Robin wherever they meet him.

Occurrence: Year around residents of the Park from the boundaries to timberline. Found in the upper valleys from May to October. Nest throughout their range.

Remarks: Like their eastern relatives, the Western Robins enjoy the vicinity of human habitations, often building their bulky mud-lined nests over the doorways of the Ranger stations. Robins begin rearing their young about the camp at Paradise at about the same time that they are starting on their second brood at Longmire Springs.

763. Varied Thrush

(Ixoreus nævius)

Size: Slightly smaller than a Robin.

General Color: Slate color above, bright rusty brown below, with black breast band; belly whitish; two reddish yellow bands on wing.

Identification: The contrasting colors, conspicuous reddish bands across wings and on breast with black

crown and chest band suffice to distinguish this dweller of the deep woods.

Occurrence: Throughout the wooded sections of the Park from March to December. Nests as late as middle July in the high valleys.

Remarks: This bird, while abundant throughout the Park, is seldom conspicuous. It is a personification of the elusive and mysterious inward spirit of the majestic forests in which it makes its home. Its color, demeanor, song, call notes, and habits harmonize perfectly with this conception. The song often heard in the early summer is described as most unique and mysterious. It is a single long-drawn note, uttered in several different keys, some of the high-pitched ones with a strong vibrant trill. It is as perfectly the voice of the cool, dark, peaceful solitude which the bird inhabits as could be imagined. Varied Thrushes are very abundant about the hotel and dwellings at Longmire Springs early in the spring and late in the autumn.

767. Western Bluebird

(*Sialia mexicana occidentalis*)

Size: Somewhat larger than an English Sparrow. Length, 6 to 7 inches.

General Color: Upper parts dark purplish blue and chestnut; throat purplish blue; breast dark rufous; rest of under parts duller. Female much duller shading to grays.

Identification: There are two bluebirds in the Park. The Western may be known from the more common, lighter colored, Mountain Bluebird by its richer blues and rufous breast.

Occurrence: A summer resident throughout the forested areas of the Park.

Remarks: The Western Bluebird has the soft warble of its kind, and the characteristic bluebird way of lifting the wings while perching.

768. Mountain Bluebird

(Sialia arctica)

Size: Similar in size and shape to the common Bluebird. Length, 6 to 7 inches.

General Color: Upper parts light purplish or greenish blue; under parts pale greenish blue. Female with blue wings and tail but dark gray body.

Identification: The Mountain Bluebird is readily recognized by its uniform pale blue color.

Occurrence: Throughout the wooded sections of the Park, preferring the open parks and burned-over areas.

Remarks: The pale blue Mountain Bluebird is one of the common birds of the upper valleys and burns. A family of these beautiful birds regularly nests in the cavity of a "ghost tree" some fifty feet from the ground just opposite the Naturalist's office at Paradise Valley. They are quiet birds, using flycatcher methods of securing insects, hundreds of which are required each day by the lusty young. In the Park at any rate, the Mountain Bluebird is less shy than the Western, often preferring the vicinity of camps and hotels.

CHAPTER XII

The Fishes of the Park[1]

Although the National Parks constitute game preserves, and no hunting or trapping is permitted, fishing is allowed, because of the fact that restocking can be done artificially. In fact many thousands of small fish hatched at the State Fish Hatcheries are planted in the streams and lakes of the Park each year.

Even with the introduction of two species of trout, the Eastern Brook and the Montana Black-spotted, into the waters of the Park, the fish fauna is a very limited one as only four species of trout are native to the region. These, the Rainbow, the Cutthroat, the Dolly Varden, and the Silver, are found in the larger streams and their tributaries. A fifth species is known to occur in streams flowing from the reservation, but outside its limits. It is not unlikely that, occasionally at least, it occurs in the Park. This is the Steelhead, a member of the genus *Salmo* that scientists have recently proven is nothing more nor less than a Rainbow trout that has adapted the ways of the salmon and has gone out to sea where it attains to considerable size and becomes silvery in color, and

[1] The author is greatly indebted to Dr. B. W. Evermann of the California Academy of Sciences and Mr. J. W. Kinney of the Washington State Department of Fisheries and Game for valuable assistance in preparing this chapter and to the California Fish and Game Commission for pictures.

then returns, like the salmon, to its native streams to spawn. The Rainbows are simply the individuals that have never gone to sea.

There are no fish occurring in the Park except those classed as trout although actually only those belonging to the genus *Salmo* are true trout. This excludes the Dolly Varden and the Eastern Brook trout which are charrs rather than true trout, and the Silver trout which is a degenerated Sock-eye salmon with the appearance of a trout but the habits of a salmon. They all, however, belong to the family Salmonidæ, which includes the trout, the charrs, and the salmon, and are consequently closely related although differing considerably in habits.

All the numerous lakes and many of the smaller streams on the mountain are cut off from the larger streams by high waterfalls. This prohibited them from containing any native fish. Many of these have been stocked and in each locality there are some lakes or streams that afford real sport to the followers of good old Isaak Walton.

Certain waters may be closed to fishing temporarily because of over fishing or restocking but these are posted and mention made of the fact in the booklet on Rules and Regulations issued each year by the National Park Service.

No license is required in the Park and there are few regulations governing fishing. Ten fish over six inches are the limit for any one person in one day. Fish under six inches if not seriously injured by the hook should be handled carefully with moist hands and returned to the water as soon as possible. Fishing with artificial lights or any gear other than with hook and line is not permitted.

There follows a list of the waters of the Park that

(Copyrighted by Asahel Curtis)

Flower-Fringed Reflection Lake. Home of Gamy Brook Trout

contain fish, the species that are most abundant, and the date when first stocked as near as that is known.

Nisqually District

Nisqually River: Cutthroat, Silver and Rainbow. Steelhead and Dolly Varden occur lower in the river but have not been reported from the Park. These are all native trout.

Tahoma Creek: Cutthroat, Silver and Rainbow.

Kautz Creek: Cutthroat, Silver and Rainbow.

Horse Creek: Cutthroat, Silver and Rainbow.

Lower Paradise River: Cutthroat, Silver and Rainbow.

Fish Creek (tributary to Tahoma Creek): Cutthroat, Silver, Rainbow and Eastern Brook. (The Brook trout are escapes from Lake George.)

Lake George: Eastern Brook trout. First stocked in 1920, restocked since.

South Puyallup River: Rainbow, Cutthroat, Silver and Dolly Varden. All native trout.

North Puyallup River: Rainbow, Cutthroat, Silver and Dolly Varden. All native.

Reflection Lake: Eastern Brook trout. First stocked in 1920.

Tatoosh Creek (outlet to Reflection Lake): Eastern Brook trout. Escapes from the lake.

Lake Louise: Eastern Brook trout. Stocked in 1920.

White River District

White River: Cutthroat, Rainbow, Silver and Dolly Varden. All native trout.

Fryingpan Creek: Cutthroat, Rainbow, Silver and Dolly Varden. Native trout.

Yakima Creek: Eastern Brook and Cutthroat trout planted in 1923.

Shaw Creek: Eastern Brook and Cutthroat trout planted in 1923.

Klickitat Creek: Eastern Brook and Cutthroat trout planted in 1923.

Barnett Lakes: Eastern Brook trout planted in 1923.

Carbon River District

Carbon River: Dolly Varden, Cutthroat, Rainbow and Silver trout—all native trout. A few Eastern Brook trout. Escapes.

June Creek: Dolly Varden, Cutthroat and Silver trout. Native.

Ranger Creek: Dolly Varden, Cutthroat and Silver trout. Native. A few Rainbow and Montana Black-spotted planted in 1921 and since.

Ipsut Creek: Dolly Varden, Cutthroat, Silver and Rainbow trout—native. Stocked with Black-spotted trout in 1924.

Spukwash Creek: Dolly Varden—native.

Chenuis Lake: Stocked with Cutthroat trout in 1915.

Lake Ethel: Stocked with Montana Black-spotted trout in 1922.

Lake James: Stocked with Montana Black-spotted trout in 1922.

West Fork of White River: Dolly Varden, Silver, Cutthroat and Rainbow are native.

Mowich Lake: Stocked with Cutthroat trout in 1915; Rainbow trout in 1923, and Montana Black-spotted trout in 1924. Restocked each season.

Meadow Creek: Montana Black-spotted trout. Stocked in 1924.

Mowich Rivers contain native trout: Dolly Varden, Rainbow, Cutthroat and Silver.

Golden Lakes (two largest lakes): Eastern Brook trout planted in 1918 in largest lake and its outlet. Rainbow trout planted in second largest lake in 1923 and restocked since.

Ohanapecosh District

Ohanapecosh River below Silver Falls contains natives including Cutthroat and Rainbow trout. The river above the Falls was stocked with Montana Black-spotted trout in 1923.

Cougar Creek: Stocked with Montana Black-spotted trout in 1923.

Chinook Creek: Montana Black-spotted trout. Stocked in 1923.

Olallie Creek: Montana Black-spotted trout. Stocked in 1923.

DESCRIPTION OF SPECIES

Cutthroat Trout

(Salmo clarkii)

Other Names: Red-throated trout, Speckled trout, Black-spotted trout.

Description: The Cutthroat trout can be readily known from all other trout by the red blotches on the membranes of the lower jaw. This mark is usually diagnostic of all the various species of so-called Cutthroat trout of which there are in Western America not fewer than a dozen recognizable forms. These different

forms may be distinguished from each other by proportional measurements, size of scales, and coloration. The Cutthroat trout is characterized by its fine scales and the presence of small teeth on the hyoid bone.

Distribution: This is a trout of the larger rivers which it follows to within a short distance of the glaciers in spite of the murky, rock-filled, glacier water.

Remarks: *Salmo clarkii* is the northern representative of this game, native trout. It is the most abundant species in the larger rivers of the Park such as the Nisqually, the White, and the Carbon, where it occurs with the Dolly Varden and the Rainbow. In this region it seldom attains a size of more than two or three pounds but what it lacks in bulk it amply makes up in gameness and flavor. May and June and October are the best seasons in which to fish the glacial streams as during midsummer they are so swollen by the melting glaciers and so filled with finely powdered rock that fishing is almost impossible.

Eastern Brook Trout

(*Salvelinus fontinalis*)

Other Names: Brook trout, Speckled trout, American charr.

Description: This beautiful fish is the best known of all our trout. It is easily distinguished from all other trout by the red spots on the sides but not on the back, and the mottled or marbled color of the dark upper parts.

Distribution: The Eastern Brook trout is native only to the eastern part of North America but because of its hardiness and splendid qualities it has been widely introduced all over the world. It is probably

the most abundant trout in the Park, having been planted in many of the larger lakes which in turn have stocked their outlet streams.

Habits: Brook trout abound chiefly in cold, slow-running meadow brooks; but they thrive in all pure cold waters whether stream or lake. The fish is wary and great skill is required to catch it. The outstanding peculiarity of its habits is evidenced by the fact that a person acquainted with its haunts can go out and catch a string of Brook trout in a comparatively short time, while others, with better tackle and equal skill, will fish a whole day for them in vain.

The larger trout are found in the deeper lakes or deep, wide pools near the source of the warmer streams. The record trout from Lake Louise, which was planted in 1920, have been from 24 to 26 inches in length and about 4½ pounds in weight.

They spawn during the late fall or early spring depending upon the locality and the temperature of the water.

Dolly Varden Trout

(*Salvelinus malma*)

Other Names: Western charr, Oregon charr.

Description: This fish may be known from all other species of *Salmonidæ* native to Western America by the presence of small red or orange spots on the body. From the Eastern Brook trout, which also has red spots on the body, the Dolly Varden may be known by the absence of blackish marblings or reticulations on the back, and by the presence of red spots on the back as well as the sides. In most cases it is much lighter in general color but this is not a sure mark as the

color varies greatly with the locality, which is also true of all other trout.

Distribution: The Dolly Varden trout is native to the streams of the Northwest from California to the Arctic. It is abundant along certain of the larger rivers, particularly the Carbon, and their tributaries where late in the fall it finds spawning grounds.

Habits: The Dolly Varden is the poorest of all trout. It does not rank high as a game fish, and as a food fish it is inferior to any other species. The flesh is white and without much flavor. The fish prefer the deep pools at the mouth of tributary streams or below waterfalls. During the spawning season large fish are often found in small, sandy streams where they appear very sluggish. It attains a weight of from two to twelve pounds. The Dolly Varden is native in all the larger rivers of the Park.

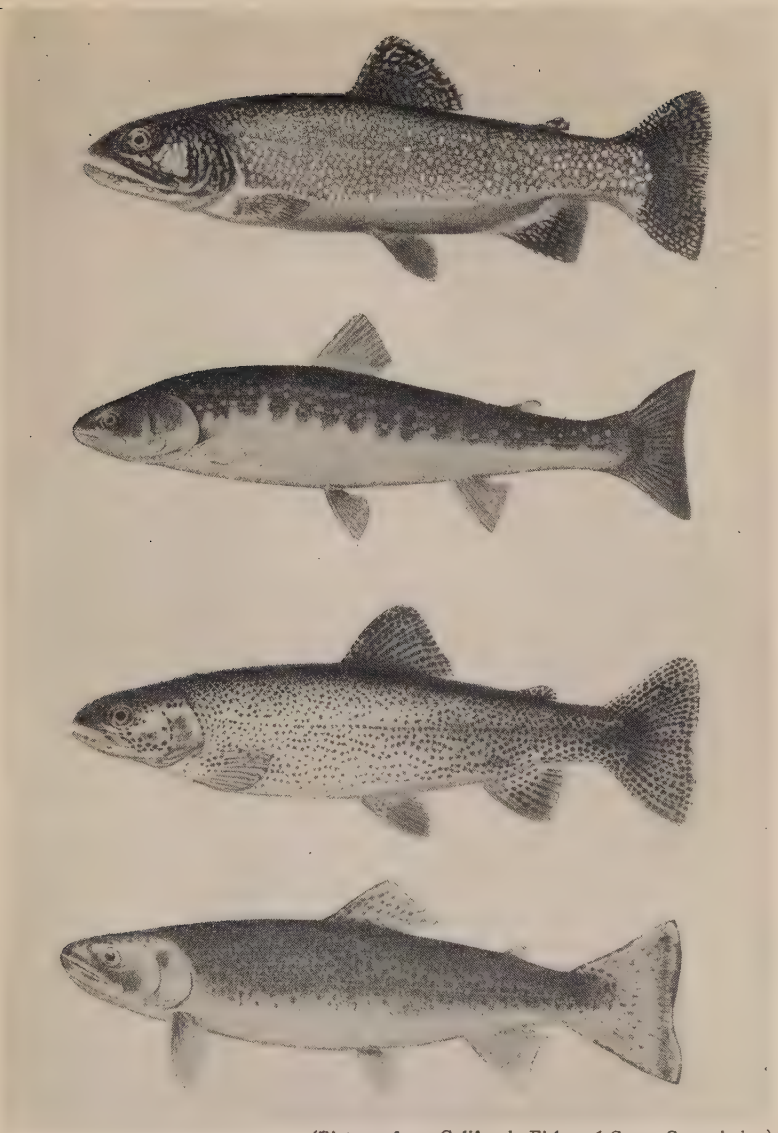
Rainbow Trout

(Salmo shasta)

Other Names: Mountain trout, Speckled trout.

Description: This is one of the most beautiful of fishes. The body is usually profusely speckled with small roundish or star-shaped black spots, which are most numerous on the back and the upper half of the sides. Down the middle of each side is a rich rosy band which gives rise to the name Rainbow. The ground-color of the back is a dark olive-green and the fins are all more or less spotted.

Distribution: Although native to the west coast, the Rainbow found in several of the lakes of the Park were hatched and planted artificially. This is the species of Rainbow trout that is native from California north. Although perhaps not so gamey as the southern species



(Pictures from California Fish and Game Commission)

The Four Species of Trout Most Abundant in the Waters of the Park

Eastern Brook Trout
Dolly Varden Trout
Rainbow Trout
Cutthroat Trout

(*Salmo iridens*), it more than makes this up in its larger size. Because of the ease with which this species may be propagated artificially it has been more widely distributed than any other of the Rainbow tribe.

Habits: As a game fish the Rainbow trout is one of the finest. It runs upstream in the early spring to spawn, leaping over waterfalls and entering the small headwater streams. Here the eggs are deposited in the sand and the young hatched out. It is a fish highly prized by anglers because of its readiness to take the fly and the spirit with which it fights as well as the fine flavor of the meat. Rainbows are great jumpers, often leaving the water in their eagerness to take the lure, and when once fairly hooked they frequently leap several feet in their efforts to dislodge the barb.

The Rainbow varies in coloring according to age, sex, and location. In beauty of color, gracefulness of form and movement, sprightliness when in the water, and reckless dash with which it battles the angler, the Rainbow trout has no equal.

Steelhead Trout

(*Salmo gairdneri*)

Other Names: Steelhead salmon, Salmon trout.

Description: The Steelhead becomes a large fish, is a bright silvery color with black spots on the back and white belly, and may be distinguished from other trout by the proportionately small head, large scales, and absence of red on the lower jaw.

Distribution: Most authorities agree that the Steelhead is merely a sea-run form of the native Rainbow trout. Like the salmon it returns to fresh water to spawn, running up the mountain streams to their headwaters. It is not known to occur in the Park

but as it is common in the lower reaches of Park rivers only a few miles below the boundaries it is probable that it sometimes inhabits the waters of the Park. Unlike the salmon the Steelhead does not die as a result of spawning.

Habits: As a game fish, the Steelhead is a favorite with anglers. Its reputation as a fighter, together with its large size and good flavor, make it a fish very much sought after. When in fresh water it will not only take the trolling spoon but will rise readily to the fly.

Black-Spotted Trout

(Salmo lewisi)

Other Names: Montana Black Spot, Black-spotted Cutthroat.

Description: *Salmo lewisi* is a land-locked species of Cutthroat trout native to the upper Snake and the upper Missouri rivers, particularly abundant in the streams and lakes of Yellowstone Park. In appearance the Black-spotted trout greatly resembles the native Cutthroat of the larger rivers. The red markings at the base of the lower jaw which have given rise to the popular name Cutthroat are present. The graduated black spots on the dark back and burnished silver sides are larger than with the native species, *Salmo clarkii*. The body is long, symmetrical, and well proportioned. The tail is squarish and the rays are marked with numerous black spots.

Distribution: This species has been "planted" extensively in the Park, particularly in the lakes of the Carbon River district, and to a less extent in the upper Ohanapecosh River and its tributaries.

Remarks: Like all the Cutthroats, the Black-spotted trout is an excellent game fish. He is a brave,

dashing fighter often leaping clear of the water salmon-like many times before he can be brought to the net. Individual trout of any species vary greatly in size as in color due to the particular character of the body of water which they inhabit and the food supply. Black-spotted trout 24 inches in length and weighing about 4 pounds are large for this region. The flesh is firm and of fine flavor.

Silver Trout

(Oncorhynchus nerka kenerlyi)

Other Name: Salmon trout.

Description: The Silver trout found occasionally in the larger rivers of the Park is in reality a species of salmon usually considered by authorities as a degenerated, often land-locked Sock-eye or Blueback salmon which constitutes the most valuable catch of the Puget Sound and Alaskan fisheries. The Silver trout which is a subspecies of this salmon seldom attains a weight in excess of three or four pounds. The fish is a rather uniform silver color with no distinctive markings. It may be identified rather by the absence of peculiar marks than their presence. The flesh is pink and of a fine flavor.

Distribution: The Silver trout is not abundant in the waters of the Park but is sometimes taken from the rivers, such as the Nisqually, Carbon, White, and Puyallup, which flow into Puget Sound. The fish ascend the streams late in the fall to spawn.

BOOK IV

WINTER ON THE MOUNTAIN

CHAPTER XIII

The Winter Season

Winter is a time of wonderful scenes, amazing vistas, ermine-trimmed woods, much pleasant weather, and exhilarating sports. The Park is a veritable fairyland to which, unfortunately, the summer visitor is a stranger. From early in December until late in the spring Boreas is King and Jack Frost is his Prime Minister. Together they hold open house on the mountain and many thousand visitors come to enjoy the views and sports they offer.

The heavy snowfall and the moderate temperatures, coupled with the accessibility by either train, stage, or private auto, are combining to make Mount Rainier National Park one of the famous winter resorts of the world. A three to four hour drive over splendid roads takes one from the almost snowless Puget Sound cities to the base of the great peak at Longmire Springs, which is the center of winter activities. Here one finds the boughs of the giant trees, which stand rank upon rank about the clearings and along the roads, weighted down with tons of crystalline whiteness and from one to six feet of snow on the ground.

The mountain itself may be hidden for days at a time by the falling flakes, which, due to the high temperatures, are usually large, and although they seem to

settle down in leisurely fashion they cover the ground, the trees, and the buildings with amazing rapidity. Sooner or later, however, the wind will shift and the peak will clear, then is the visitor doubly rewarded for his wait.

After periods of storm the sun looks down upon a mountain of purest white. Hardly a square yard of rock is exposed to mar the flawless expanse of snow. So brilliant is the peak on these clear days of winter following the snows that the eye can hardly look upon it, and when the sun sinks low in the west and touches the crests with old rose and gold the scene passes beyond the ability of words to describe it.

At all times is the old peak inspiring but in winter when all is silent and serene it would seem that one must be lifted above the trivial things of earth by the majesty of his surroundings.

Giant trees rooted in earth reach upward toward heaven; velvet green, they are trimmed in purest white. Snow fields sweep on and up in gentle curves and graceful undulations, the circle of lesser peaks festooned with ice and fringed with wind-swept trees clothed in frost. These appear small and fragile in the distance as though one might pluck them and crumple them between one's fingers; and ever above and beyond the mighty mountain, draped in ice and canopied with clouds, the great white throne of Manitou—Guardian Spirit—ever mindful of the needs of man.

Coming by car from either the Puget Sound or the southern cities the visitor travels over well surfaced roads to Longmire Springs at an elevation of 2,700 feet, 6.5 miles within the Park. Beyond this point it is impossible to keep the road open for automobile travel. Usually snow is encountered along the road before the Park Entrance is reached and from the

Paradise Inn and the Tatoosh Range

More than 100 feet of snow falls in Paradise Valley each winter

Paradise Inn and the Tatoosh Range

Summer

Entrance to Longmire the car passes between great banks of snow piled high by the plows which constantly combat the elements in the struggle to keep the road open.

Above Longmire, the road is broken for sleighs and the trail to Paradise Valley usually is well packed by sled dogs and snowshoes.

Visitors find comfortable accommodations at National Park Inn, Longmire Springs, and Paradise Camp in Paradise Valley, 5.9 miles by trail above Longmire. When snow lies four feet deep in the low valleys it is usually between fifteen and twenty-five feet deep in the high valleys. Paradise Inn and Paradise Camp, at an elevation of 5,400 feet, are often almost entirely covered by the snow which drifts about the buildings.

The trail to Paradise Valley leaves the road at a point about 200 yards above the hotel at Longmire Springs. For two miles, with easy grades, it follows the Nisqually River through forests of giant trees. At the Eagle Peak Mining Camp the trail crosses the Nisqually and proceeds up the Paradise River. Beyond the 2.4 mile post the grades become steeper and the scenery more varied. Alongside, the Paradise River, which is rarely covered with snow at this elevation, is constant company. Above ice-fringed Carter Falls the river is crossed and the right-hand bank followed through a heavy forest of hemlock and fir to Narada Falls, 4.4 miles from Longmire. Frequently Narada Falls is completely covered with snow and ice. The Ranger station located here furnishes a welcome rest and a chance for a comfortable lunch.

Beyond Narada the trail climbs approximately 1,000 feet in 1.5 miles. The country is more open, the trees smaller and the forests less dense.

Paradise Valley in winter is a sight worth seeing.

All of the smaller trees and irregularities of the landscape are completely buried. Here and there clumps of alpine fir and black hemlock break through but these are often so encased in ice and snow that they resemble white-cloaked giants, huddling together for warmth, rather than trees.

Usually the trail is packed so hard by constant travel that snowshoes are required only above Narada, and at times not even there. Following storms when the new snow is soft, it is necessary to use either skis or snowshoes the entire distance. At such times it often requires 6 or 7 hours to cover the trail but ordinarily 4 hours is ample time for a comfortable trip. The trip down is made in from 2 to 3 hours. Travel on snowshoes is often fatiguing and should never be hurried. Only those with experience should attempt the Paradise Valley trip on skis because of the steep grades and heavy forests which make ski running difficult.

It is possible, but not advisable, to attempt the round trip in one day. The open country about Paradise Inn offers unexcelled opportunities for ski running and tobogganning and the views along the trail, even on dull days, are well worth the trip.

There are many shorter trips for the snowshoe or ski enthusiast about Longmire Springs that can be made in from an hour to a half day and the 7-mile Indian Henry's Trail offers rare views and great sport for the hardy travelers.

Winter Sports

Few forms of amusement offer the health-giving exercise, the thrilling experiences, and the same degree of safety, and are participated in among such inspiring surroundings as are the winter sports. Snowshoe trails

Dog-Team in Paradise Valley

A team of Eskimo Huskies on a trail in an Alpine Park

(Photograph by Ranapar Studio)

On a Winter Trail in the High Country

lead one out into the open country where the air is pure and invigorating and the landscape ever new and beautiful. While snowshoeing itself can hardly be called sport it is a means of acquiring much real pleasure and good exercise and occasionally snow cornices and steep slopes afford a jolly slide.

Tobogganing in open country or on well constructed slides such as those at Longmire Springs is comparatively safe and offers a great many real thrills. The climb back to the top of the hills gives the desired exercise.

Sleighing along the automobile roads with congenial company, plenty of warm robes and fleet horses, or behind a well-trained dog team in light Alaskan sledges is a sport which never lacks popularity. Sleighing is particularly enjoyable in the National Park because of the beautiful scenery and the fact that the automobile has almost driven horses from the roads in more developed sections.

King of all winter sports is skiing. With cross country trips, ski-joring, a variety of hills to slide down, and the more difficult feat of jumping, skiing offers sport and thrills for all.

Along the lower roads and trails and in the more open high country, cross-country skiing affords wonderful exercise. Along the roads about Longmire Springs ski-joring may be indulged in and steep slides and ski jumps are constructed each winter both at Longmire Springs and Paradise Valley.

Ice skating is possible at times at Longmire but is never a dependable sport because of the high temperatures and heavy snows.

Each evening about the roaring wood fires of the hotels or camps the day's sport is enjoyed all over again as merry parties discuss the day's activities.

Since it is the purpose of the writer to make this book serve as an aid to the enjoyment of the Park it may be well to add a few brief notes that may assist the winter-sports novice in mastering the "tools of the trade" and therefore add to his enjoyment.

No matter what the sport, attention should first be given to the equipment. A person can no more learn to ski with ill-fitting skis or skate with loose skates than he can play tennis with "dead" balls or golf with unbalanced clubs.

Snowshoeing requires considerable endurance, if indulged in to any extent, but little or no skill. A tramp may, however, be made either pleasant or miserable by the right or wrong choice of shoes and bindings. The heavy snow common to the region does not readily fall through the web of closely woven shoes and consequently they become exceedingly heavy. The rough going and heavy timber make long shoes cumbersome, so, contrary to experience in most snow countries, the ideal shoe is a short model of very coarse weave. Personally, I find the style commonly designated by the name "Beaver tail" about the ideal, but as ordinarily manufactured the weave is too fine and the tip does not turn up quite enough. Many people prefer the tailless "Bear paw" shoe. The "Bear paw" is usually woven with an open web which is an advantage, but it is too wide for comfortable walking and does not turn up at the toe. For persons of average weight a ten to twelve inch shoe is amply wide and with such a shoe there is little or no interference when walking normally.

Bindings on either snowshoes or skis are often given scant attention by the average beginner but they are most important. A snowshoe should hinge easily at the toe so that the tail drops readily upon lifting

(Photograph by Ranapar Studio)

Ski Jumping on July 4th, in Paradise Valley

Here at an elevation of 5,500 feet the snow lies until well into the season and winter sports may be enjoyed under summer conditions alongside the flower fields

(Photograph by Ranapar Studio)

A Toboggan Slide on the Lower Slopes of Eagle Peak

Winter sports of all sorts are very popular in the National Park where King Boreas reigns for several months each year

the foot, but at the same time it should be firmly attached to the boot to prevent the shoe flopping. An adjustable boot with metal hinge is ideal if it does not cramp the toe.

Rubber packs or heelless shoes should always be worn with snowshoes as heels quickly cut through the web and ruin the shoe. If it is necessary to wear boots with heels, a square of some heavy material such as rubber or leather belting may be tied to the webbing where the heel strikes.

In skiing, even more attention should be given to the equipment. Two ski poles should be used. An expert ski runner propels himself almost as much by means of his poles as he does by his skis. These poles should be light, preferably of bamboo, with rings to prevent their sinking in the snow, and thongs to give better hand holds. A good way to determine the length of skis needed is to measure them against the body. One should be able to just reach the tip of his ski with extended arm when standing alongside it. This is usually between seven and eight feet. Many people believe that simple toe straps are sufficient to fasten the ski to the foot. This is entirely wrong. The skis should be just as securely fastened as skates and for the same reason. In order to control the skis one must be able to turn them by turning the foot which is not possible with toe straps only. A good ski binding must fix the tip of the toe solidly to the ski but at the same time allow one to bend the knee until it touches the ski in front of the foot with comfort. For this reason the binding should not be placed higher on the foot than the heel of the boot. Good ski boots should have heavy leather heels and stiff leather soles. They should also be large enough to allow for heavy wool socks.

The ability to ski well depends more upon practice

than upon instructions, but a few pointers will help in acquiring the knack.

It is well to start out on cross-country running. One moves very much as in walking except that the ski is not raised from the ground. Hold the skis parallel and close together. Lean well forward, advance one foot with the knee bent, and push the ski ahead as far as possible; while this ski is still moving forward advance the other foot in the same manner. The poles will aid greatly in maintaining a smooth, even, gliding step.

In climbing hills the skis may be made to stick better by lifting them somewhat and putting them down with a quick slap. When the slope becomes too steep it may be taken at an angle, switching back and forth. If the hill is short and very steep it can be climbed quickly by side-stepping. Experienced skiers do not remove their skis for any hill that it would be possible to walk up. The sticks will be found particularly valuable in climbing hills. It is in running downhill that the real thrill comes. The skis should be held close together, the knees almost touching. It is well to allow one ski to run slightly ahead of the other with most of the weight on the rear ski. This necessitates bending the knee slightly. The sticks are not used in traveling downhill and should always be dragged or carried with the points to the rear.

Beginners will find the "kick-turn" the most useful and easiest of mastery. This is a complete "about-face" easily accomplished from a standing position. If the turn is made to the right, the right foot is kicked out straight in front until the heel of the ski clears the ground near the toe of the left ski. Then the foot is turned out and the ski placed alongside the other but in the opposite direction. Now the left ski is brought

around and the runner proceeds in the opposite direction. To turn to the left, the left foot is moved first. Two other turns, known as the "Telemark" and the "Christiania" swings, are used for stopping or turning in full descent. Both are graceful and comparatively easy to master with a little practice. Swings and the more difficult feats of ski jumping may be more easily learned by watching others do them and copying their methods than from printed instructions, so no attempt will be made here to explain them. In any crowd of skiers one may easily find someone who will gladly explain and demonstrate. Many other tricks of running, turning, and stopping are acquired with a little practice.

Tobogganing even on well-constructed slides is the least safe of any form of winter sport. On steep hills the toboggan acquires tremendous speed and is not readily stopped or turned. It is well to be certain of the course and the landing rather than depend upon any ability to guide or stop the flight. Of importance also is the loading of the sled. The weight should be as low as possible and any chance of arms or legs protruding beyond the sides avoided. For this reason it is advisable to ride in a reclining position rather than sitting upright and not to overload the toboggan.

Skating is so universally known it requires no comment here.

The chief concern in the matter of clothing for winter sports should be for warm, dry footwear. Stout boots, high enough to keep snow out, and large enough to permit the wearing of wool socks, are essential. Aside from boots and socks the clothing should be as light and comfortable as possible for it is easy to become overheated, when actively participating in exhilarating sports.

Weather Conditions

The Mount Rainier National Park lies within a zone where the precipitation is very great, varying between about 75 inches (of water) on the lower slopes and 130 inches between 8,000 and 10,000 feet elevation, a fact which accounts for the presence of huge glaciers and abundant forests. On first thought this would make it appear that the weather is extremely damp and unfavorable, but such is not the case.

Very little rain falls in July and August, the average over a ten-year period being a little more than a half inch per month with the sun shining on 98% of the days, and in the winter months practically all of the precipitation is in the form of snow.

The fact that parts of the Park have perhaps the heaviest snowfall found anywhere within the United States adds rather than detracts from its attractiveness as a center for winter sports. At Longmire Springs weather records for the past ten years show that the average annual snowfall totals 18 feet, with an average depth on the ground of between 2 and 3 feet and a maximum depth of 7 feet. At the same time the mean temperature over the same period of time for the three winter months has been 31.8° F. or an average of only slightly below freezing. The lowest temperature ever recorded at Longmire was − 7° and at Paradise Valley −17°, but zero weather is very unusual at Longmire and not common in Paradise Valley. The annual mean in the Park for ten years has been 43.5° F.

The prevailing westerly wind off the warm Japan Current of the North Pacific carries great quantities of moisture-laden air against the peak where the cool surface precipitates it, largely in the form of snow. The belt or zone of greatest precipitation is between

Where Winter Reigns

Paradise Valley

elevations of 5,000 and 10,000 feet, the height of the normal storm clouds, a fact borne out by the great glacial development at this level. In Paradise Valley the total snowfall for the winter often exceeds 100 feet and it is not at all unusual to find 20 or more feet of snow on the level with drifts from 60 to 100 feet deep. This heavy snow, in spite of the warm days of spring and early summer, remains in sheltered places about Paradise Inn until midsummer, necessitating the opening of the upper 4 miles of road each season by steam shovels. About 6,000 feet elevation perpetual snow is encountered, not because of the low temperature but because such a volume of snow falls that it is impossible for the summer sun to entirely remove it between the periods of snowfall.

This condition makes it possible not only to enjoy winter sports in winter but to enjoy winter sports and summer sports at the same time and under similar conditions in midsummer. For several years an annual ski tournament and snow carnival has been held in Paradise Valley on the 4th of July. Frequently several feet of snow is found at this time on the sheltered slopes, while on the opposite exposed slopes nearby, myriads of multi-colored wild flowers bloom in unbelievable profusion.

INDEX

A

Abies amabilis, 215–16
Abies grandis, 219–20
Abies lasiocarpa, 217–19
Abies nobilis, 217
Accipiter atricapillus striatulus, 282–3
Accipiter cooperii, 282
Accipiter velox, 281–2
Acer circinatum, 228
Acer macrophyllum, 228
Achillea lanulosa, 145–6
Achlys triphylla, 150
Actitis mascularia, 275–6
Adams, Mount, 3, 5
Adder's tongue, 198
Adiantum pedatum aleuticum, 195
Agoseris alpestris, 175
Alder, red or Oregon, 229
Allen, G. F., material on forests of Mount Rainier National Park, 199 ff.
Allotropa virgata, 166
Alnus oregona, 229
Alpine beauty, 148
Alpine meadows, 8, 135
Alta Vista, 112
Ammodramas sandwichensis alaudinus, 307
Ampelis cedrorum, 313
Anaphalis margaritacea occidentalis, 141–2
Anemone, forest, 149
Anemone, western, 138–9
Anemone, wood, 149
Anemone deltoidea, 149
Animals of Mount Rainier National Park, 231–66
Antennaria lanata, 142
Antennaria media, 142
Anthus pensilvanicus, 317
Anvil Rock, 117
Aplodontia rufa phæa, 251
Aquila chrysaëtos, 284
Aquilegia formosa, 157, 172, 178
Arctic-Alpine life zone on Mount Rainier, 133–4
Arctostaphylos uva-ursi, 145
Ardea herodias, 274
Arnica, 175
Arnica latifolia, 175
Asarum caudatum, 165–6
Ash, mountain, 143, 150, 230
Aster, 183
Aster, golden, 180
Aster, purple, 182
Aster, short-stemmed, 183, 189
Automobile camp, public, in Paradise Valley, 96
Avalanches, on Nisqually Glacier, 19; on Willis Wall, 36

B

Bailey, Florence Meriam, material on birds of Mount Rainier National Park region, 267 ff.
Baker, Mount, 3, 91
Barber's pole, 166
Bats, 265
Bear, black, 238–9
Bear grass, 140–1, 151
Beaver, American, 252–3
Beaver, mountain, 251
Berberis aquifolium, 178
Bikukulla formosa, 165
Bilberry, 158
Birds of the Mount Rainier National Park region, 267–328

Blackbird, Brewer, 302–3
Bleeding heart, wild, 164
Bluebell, 183–4, 187
Bluebell, Virginia, 182
Blueberry, 158
Blueberry, high-bush, 162–3
Blueberry, low-bush, 163
Bluebird, mountain, 328
Bluebird, western, 327–8
Blue bonnets, 181–2
Bobcat, 240
Bonasa umbellus sabini, 277–8
Botrychium lanceolatum, 198
Botrychium lunaria, 198
Bracken, common, 192–3
Brake, Nootka rock, 196–7
Bramble, bird's-foot, 149
Bramble, snowy, 158
Branta canadensis, 273–4
Bubo virginianus saturatus, 287–8
Buffalo clover, 181–2
Bunchberry, 147
Buteo borealis calurus, 283
Buteo swainsoni, 283
Buttercup, Suksdorf, 174, 180

C

Caltha leptosepala, 152
Calypso, 167
Calypso bulbosa, 167
Campanula rotundifolia, 183–4, 187
Camp robber, 299–300
Canadian life zone on Mount Rainier, 132
Canis gigas, 241
Canis latrans lestes, 242
Capnoides scouleri, 164
Carbon Glacier, 11, 35–8, 125
Carbon River, 38, 45
Carbon River district, 124–6; fishes in, 332–3
Carpodacus cassini, 303–4
Cascade Range, 3, 4, 5, 10, 11, 12, 20, 46, 47, 91
Cassiope mertensiana, 140
Castilleja miniata, 155
Castilleja oreopola, 154–5
Castilleja rupicola, 155
Castle Rock, 93
Castor canadensis pacificus, 252–3
Cedar, Alaska yellow, 224–5
Cedar, canoe, 210–12
Cedar, shingle, 210–12
Cedar, western red, 210–12
Ceophlæus pileatus abieticola, 291–2
Certhia familiaris occidentalis, 320
Cervus canadensis occidentalis, 236–7
Ceryle alcyon, 289
Chætura veauxii, 294–5
Challis cup, 138–9
Chamæcyparis nootkatensis, 224–5
Chehalis, 251
Cheilanthes gracillima, 197
Chelone memorosa, 170
Chenuis Mountain, 125
Chickadee, chestnut-backed, 322–3
Chickadee, mountain, 322
Chickadee, Oregon, 321–2
Chimaphila sp., 167
Chipmunk, Cooper, 256
Chipmunk, little, 255–6
Chordeiles virginianus henryi, 294
Cinclus mexicanus, 317–18
Cinquefoil, 173
Circus hudsonius, 281
Cirque, glacial, 35, 36–7, 46–7
Citellus columbianus columbianus, 254–5
Civet cat, 250
Claytonia lanceolata, 160
Climatic conditions about base of Mt. Rainier, 199
Clintonia uniflora, 148
Coccothraustes vespertinus montanus, 303
Cock-of-the-woods, 291–2
Colaptes cafer collaris, 293–4
Columba fasciata, 280–1
Columbia Crest, 6, 77
Columbia River, 27
Columbine, 157, 172, 178
Colymbus nigricollis var., 271–2
Contopus borealis, 296
Cony, 258–9
Cornus canadensis, 147
Corvus caurinus, 300–1
Corvus coral sinuatus, 300
Cottonwood, black, 229–230
Cougar, 239–40
Cowbane, 153
Cowlitz Chimneys, 30, 93

Cowlitz Cleaver, 26
Cowlitz Glacier, 11, 25–9
Cowlitz River, 27
Cowlitz River Trail, 120–1
Cow parsnip, 153
Coyote, mountain, 242
Creeper, tawny, 320
Crevasses, 15, 16–17, 23
Crossbill, American, 304
Crossbill, white-winged, 304–5
Crow, Clarke, 301–2
Crow, northwest, 300–1
Cryptogramma acrostichoides, 196–7
Cudweed, 142
Cudweed, cat's-paw, 142
Currant, mountain, 191
Currant, red flowering, 164
Cyanocitta stelleri, 298–9

D

Dafila acuta, 272–3
Dandelion, mountain, 175
Deer, Columbia black-tailed, 235–6
Deer's tongue, 137–8
Dendragapus obscurus fuliginosus, 276–7
Dendroica æstiva, 315
Dendroica auduboni, 315
Dendroica occidentalis, 316
Dendroica townsendi, 316
Devil's club, 153
Dipper, 317–18
Dock, mountain, 139–40
Dodecatheon jeffreyi, 156, 168–9
Dogwood, Canada, 147
Draba aureola, 180–1
Dryobates pubescens gairdnerii, 290
Dryobates villosus harrisii, 289–90
Dryopteris oreopteris, 194
Dryopteris spinulosa dilatata, 194–5
Duck, harlequin, 273
Dutchman's breeches, 165

E

Eagle, bald, 284–5
Eagle, golden, 284
Eagle Peak Trail, 120
East Side Trail, 122–3
Echinopanax horridum, 153
Echo Rock, 38
Edmunds, Senator George F., 40
Edmunds Glacier, 12
Elderberries, 144
Elk, Olympic on Roosevelt, 236–7
Elysian Fields, 38
Emmons, Samuel F., 31
Emmons Glacier, 11, 31–2, 123–4
Empidonax difficilis, 296–7
Entamias cooperii, 256
Entamias townsendii, 255–6
Epilobium, 145
Epilobium, arctic, 159–60, 170
Epilobium alpinum, 145
Epilobium anagalladifolium, 159–60, 170
Epilobium angustifolium, 155–6
Epilobium luteum, 180
Eptesicus sp., 265
Ereunetes pusillus, 275
Erigeron aureus, 180
Erigeron salsuginosus, 183
Erosion by glaciers, 27–8
Erythronium montanum, 137–8
Erythronium parviflorum, 174
Everlasting, pearly, 141–2
Evermann, Dr. B. W., material on fishes in Mount Rainier National Park, 329
Evotomys gapperi occidentalis, 261
Eucephalus ledophyllus, 182

F

Falco sparverius deserticola, 285–6
Fauna of glaciers, 47–9
Felis oregonensis oregonensis, 239–40
Ferns of Mount Rainier National Park: brittle, 197; Christmas, 193; common bracken, 192–3; deer, 193–4; holly, 198; lace, 197; licorice, 196; maidenhair, 195; mountain polypody, 198; Nootka rock brake, 196–7; oak, 195; parsley, 196–7; sword, 193; western lady, 194; wood, 194–5
Fiber zibethicus osoyoosensis, 251–2
Filix fragilis, 197
Finch, Cassin purple, 303–4

Finch, pine, 306
Finch, rosy, 305–6
Fir, alpine, 217–19
Fir, amabilis, 215–16
Fir, Douglas, 209–10
Fir, lovely, 215–16
Fir, lowland white, 219–20
Fir, Noble, 217
Fir, silver, 215–16, 219–20
Fir, sub-alpine, 217–19
Fire, effects of, on forests, 203–6
Fireweed, 155–6
Fireweed, yellow, 180
Fisher, 246
Fishes of Mount Rainier National Park, 329–39
Flett, Prof. J. B., 38; assistance in flora of Mount Rainier National Park, 135
Flett Glacier, 12, 38–9
Flicker, red-shafted, 293–4
Flora and fauna of Mount Rainier, 127 ff.
Flora of glaciers, 47–9
Flowers of Mt. Rainier National Park, 135–91
Flycatcher, olive-sided, 296
Flycatcher, western, 296–7
Flying squirrel, 254
Forests of Mount Rainier National Park, 199–230
Fourth of July carnival in Paradise Valley, 353
Fox, Cascade red, 242–3
Foxglove, wild, 171, 173
Frogs, 266
Fryingpan Creek, 30
Fryingpan Glacier, 12, 29, 30
Fujiyama, 5

G

Gallinago delicata, 276
Gaultheria ovatifolia, 146–7, 161–2
Gentian, blue, 185, 186
Gentiana calycosa, 185, 186
Geological development of the region of Mount Rainier, 91–2
Ghost pipe, 147–8
Gibraltar Rock, 8, 26, 77
Glacier Basin, 124
Glacier Island, 41, 42
Glacier National Park, 10
"Glacier tables," 33–5
Glacier Trail, 118
Glacier Vista, 117
Glaciers, nature and movement of, 13–14; crevasses, 15, 16–17; moraines, 15–16; "névé" or granular snow material, 17; sun's action on, 17–18; conditions favorable for development of, 21; a typical interglacier, 22; erosional work of, 27–8; evolution of glacial cirques, 36–7, 46–7; fauna and flora of, 47–9
Glaciers in the Rocky Mountains, 10
Glaciers of Mount Rainier, 4, 8; detailed description of, 10–49
Glaucomys sabrinus fuliginosus, 254
Glaucidium gnoma californicum, 288–9
"Glissades," 23
Goat, White Mountain, 237–8
Goat Mountain (Mount Wow), 4
Goose, Canada, 273–4
Gopher, Rainier pocket, 256
Goshawk, western, 282–3
Grape, Oregon, 178
Grape ferns, 198
Grass of Parnassus, 152
Grebe, earred, 271–2
Grosbeak, black-headed, 311–12
Grosbeak, western evening, 303
Grouse, Oregon ruffed, 277–8
Grouse, sooty, 276–7
Gulo luscus, 247

H

Haliæëtus leucocephalus, 284–5
Hard-hack, 157–8
Hare, varying, 257–8
Harebell, 183–4, 187
Hawk, Cooper, 282
Hawk, desert sparrow, 285–6
Hawk, marsh, 281
Hawk, sharp-shinned, 281–2
Hawk, Swainson, 283
Hawk, western red-tailed, 283
Heath, 153–4
Heath, white, 140
Heather, bride's, 140
Heather, purple, 153–4

Heather, red, 153–4
Heather, white, 140
Heather, yellow, 176
Heliotrope, mountain, 139
Hell-diver, 271–2
Hellebore, false, 144
Hellebore, false green, 190
Hellebore, giant, 144, 190
Helminthophila celata lutescens, 314–15
Helodromas solitarius cinnamomeus, 274–5
Hemlock, black, 220–1
Hemlock, mountain, 220–1
Hemlock, western, 212–14
Heracleum lanatum, 153
Heron, great blue, 274
Histrionicus histrionicus, 273
Hood, Mount, 3, 5, 91
Huckleberry, blue, 162–3
Huckleberry, dwarfed, 158
Huckleberry, red, 163–4
Hudson's Bay Company, 51
Hudsonian life zone on Mount Rainier, 132–3
Hummingbird, calliope, 295–6
Hummingbird, rufous, 295
Hylocichla guttata, 325–6
Hylocichla usulata, 325

I

Ice Age, the, 12, 46, 47
Ice cascades, 33
Ice domes, 33
Indian Bar, 30
Indian basket grass, 140–1, 151
Indian Henry's Hunting Ground, 8, 119
Indian Henry Trail, 118, 119
Indian names bestowed on objects and places in Mount Rainier National Park, 83
Indian paintbrush, 154–5
Indian paintbrush, orange, 155
Indian pipe, 147–8
Indian tobacco, 142
Indian warrior, 177
Indians of the vicinity of Mount Rainier, 79 ff.
Ingraham, Major E. S., 26, 32
Ingraham-Cowlitz Glacier, 11, 25–9
Inter Glacier, 12, 32–3
Ipsut Pass Trail, 124
Ixoreus nævius, 326–7

J

Jacob's ladder, 183
Jay, gray, 299–300
Jay, Steller, 298–9
Junco, intermediate or Shufeldt, 309
Junco, Oregon, 309
Junco hyemelis connectens, 309
Junco hyemelis oregonus, 309

K

Kalmia polifolia microphylla, 160
Kautz, Gen. A. V., 43; account of the first attempt to scale Mount Rainier by, 52–61
Kautz Glacier, 11, 43–4
Kingfisher, belted, 289
Kinglet, ruby-crowned, 323–4
Kinglet, western golden-crowned, 323
Kinney, J. W., material on fishes in Mount Rainier National Park, 329
Kinnikinnick, 145
Klickitat Trail, 122

L

Lady tobacco, 142
Lady's slipper, 167
Lagopus leucurus var., 278–9
Lakes Trail, 114, 115, 116
Lanius ludovicianus excubitorides, 313–14
Lark, Alaska horned, 297
Lasionycteris sp., 265
Lassen, Mount, 91
Laurel, dwarfed, 160
Le Conte, Prof. J. W., determination of rate of glacier movement by, 13
Lepus bairdii cascadensis, 257–8
Leucosticte, Hepburn, 305–6
Leucosticte tephrocotis littoralis, 305–6
Liberty Cap, 6, 8, 37, 78
Liberty Ridge, 37

Life zones in Mount Rainier, 129–34
Ligusticum purpureum, 143
Lilium parviflorum, 157, 178
Lily, avalanche, 137–8
Lily, glacier, 174
Lily, Washington, 157
Lily, wild tiger, 157, 178
Lily, yellow avalanche, 174
Linnæa americana, 161
Linnæus, Swedish botanist, 161
Little Tahoma, 7; glaciers on, 29ff; 93
Longmire, Ben, 80
Longmire, James, 78
Longmire Springs, 7, 21, 78, 95, 118, 121
Lophortyx californicus, 279–80
Lousewort, 177
Lousewort, common, 159
Lousewort, duck's-bill, 156, 169
Lousewort, elephant's-trunk, 157, 169
Loxia curvirostra minor, 304
Loxia leucoptera, 304–5
Lupine, arctic, 181–2
Lupine, Lyall's, 188
Lupinus Lyallii, 188
Lupinu subalpinu, 181–2
Lutkea, 142–3, 176
Lutkea pectinata, 142–3, 176
Lutra pacifica, 247–8
Lynx, bay, 240
Lynx, Canada, 240–1
Lynx canadensis canadensis, 240–1
Lynx vinta, 240
Lysichiton camtschatcense, 179

M

McClure's Rock, 117
Magpie, black-billed, 297–8
Maidenhair fern, 195
Maple, broadleaf, 228
Maple, vine, 228
Marigold, marsh, 152
Marmot, hoary, 243–4
Marmota primrosa, 243–4
Martes americana caurina, 245–6
Martes pennanti pacifica, 246
Martin, 245–6
Martin, fisher, 246
Matthes, F. E., "Mount Rainier and its Glaciers," general description of the mountain quoted from, 3–9; material for description of the glaciers taken from, 10 ff.; notes by, on the ascent of Mount Rainier, 108–12
Meadowlark, western, 302
Meany, Edward S., Professor, material supplied by, for history of Mount Rainier National Park region, 50 ff.
Megascops asio, 287
Melanerpes torquatus, 292–3
Melospiza lincolnii, 310
Melospiza melodia morphna, 309–10
Merganser, red-breasted, 272
Merganser serrator, 272
Mertensia, 161, 182
Mertensia lævigata, 161, 182
Merula migratoria propinqua, 326
Mesenchytræus, 48
Mice, meadow or field, 263
Microtus richardsoni, 262–3
Microtus sp., 263
Mimulus, alpine, 179
Mimulus alpinus, 179
Mimulus lewisii, 168
Mimulus, red, 168
Mineral springs at Longmire, 121
Mink, American, 248
Moles, 264
Monkey flower, Lewis, 168
Monotropa uniflora, 147–8
Moraine Park, 35; 125
Moraines, 15–16
Mother Mountains, 4, 45, 46–7; 93
Mount Rainier National Park, fluctuation in volume of rivers, of, 28; creation of, 79; Indian names bestowed on objects and places in, 83; description of the Park and its administration, 87–90; scenic features of, 91–4; roads, 94–8; trails, 98 ff.; flora and fauna of, 127 ff.; flowers of, 135–91; ferns of, 192–98; forests of, 199–230; animals of, 231–66; birds of the Park region, 267–328; fishes

Mt. Rainier Nat'l Park—*Cont'd.*
of the Park, 329–39; the Park as a winter resort, 343 ff.; weather conditions in, 352–3
Mountain beaver, 251
Mountain lion, 239–40
Mouse, deer or white-footed, 260–1
Mouse, house, 260
Mouse, jumping, 262
Mouse, large-footed meadow, 262–3
Mouse, mountain lemming, 263
Mouse, western red-backed, 261
Mowich Lake, 45–6, 124–5
Mowich River, 45
"Mud puppies," 266.
Muddy Fork of Cowlitz River, 27
Muir, Camp, 21, 117
Muir, John, 78
Mus musculus, 260
Muskrat, 251–2
Mustard, yellow, 180–1
Mustela rixosa, 249–50
Mustela vison energumenos, 248
Mustela washingtoni, 249
Myadestes townsendi, 324–5
Mystic Lake, 125

N

Narada Falls, 116
National Forest Service, 89, 90
National Forests, 89–90
National Park Inn, 95, 345
National Park Service, 87
National Parks, 87
Natural Bridge, 125–6
Nature Guide Service, 89
Needle Rock, 39
Nelson, Dr. E. W., material on animals of Mount Rainier National Park, 231 ff.
Neosorex sp., 264–5
Neotoma cinerea occidentalis, 259–60
"Névé," Swiss term for glacial granular snow material, 17
Nighthawk, Pacific, 294
Nisqually district, fishes in, 331
Nisqually Glacier, 11, 12–22, 113
Nisqually River, 12, 13
Nisqually River ridge, 12, 13
Nisqually road, building of, 79
Nisqually Valley, 4, 12
North Mowich Glacier, 11, 39
Northern Loop Trail, 126
Nucifraga columbiana, 301–2
Nutcracker, 301–2
Nuthatch, red-breasted, 321
Nuthatch, slender-billed, 320–1
Nyctala acadica scotæa, 286–7

O

Observation Rock, 38
Ochotona tenisex brunnescens, 258–9
Odocoileus columbianus columbianus, 235–6
Ohanapecosh district, 126
Ohanapecosh district, fishes in, 333
Ohanapecosh Glacier, 12, 29–30
Ohanapecosh Hot Springs, 7, 126
Ohanapecosh Park, 30
Ohanapecosh River, 27, 30
Olbiorchilus hiemalis pacificus, 319–20
Olympic Range, 11
Oncorhynchus nerka Kenerlyi, 339
Oreamnos americanus americanus, 237–8
Oreastrum alpigenum, 183, 189
Oregon grape, 178
Otocoris alpestris articola, 297
Otter, 247–8
Ouzel, water, 317–18
Owl, California pygmy, 288–9
Owl, dusky horned, 287–8
Owl, northern spotted, 286
Owl, northwest saw-whet, 286–7
Owl, screech, 287
Oxalis oregana, 165

P

Pacific Highway, 96
Painted cup, 154–5
Panhandle Gap, 31
Panorama Point, 117
Paradise Camp, 96; in winter, 345
Paradise Glacier, 12, 22–5, 77, 113
Paradise Glacier Trail, 115
Paradise Inn, 95–6, 345

Paradise Park, 8; snowfall at, 21
Paradise River, 25, 77
Paradise Valley, 95, 112; in winter, 345–6
Parnassia fimbriata, 152
Parus atricapillus occidentalis, 321–2
Parus gambeli, 322
Parus rufescens, 322–3
Passerella iliaca, 310–11
Passerina nivalis, 306–7
Pedicularis, 177
Pedicularis bractosa, 177
Pedicularis contorta, 177
Pedicularis grœnlandica surrecta, 157, 169
Pedicularis ornithorhyncha, 156, 169
Pedicularis racemosa, 159
Pentstemon, 171, 173, 176–7, 185, 188, 189
Pentstemon confertus, 176–7, 185
Pentstemon menziesii, 171, 188, 189
Pentstemon procerus, 177, 185, 189
Pentstemon rupicola, 171, 173
Perisoreus obscurus griseus, 299–300
Peromyscus leucopus, 260–1
Phegopteris alpestris, 198
Phegopteris dryopteris, 195
Phenacomys intermedius olympicus, 263
Phlox, mountain, 187, 188
Phlox diffusa, 187, 188
Phyllodoce empetriformis, 153–4
Phyllodoce glanduliflora, 176
Pica pica hudsonica, 297–8
Picea sitchensis, 225–6
Picoides americanus fasciatus, 290–1
Pigeon, band-tailed, 280–1
Pine, lodgepole, 223–4
Pine, western white, 214–15
Pine, white-bark, 221–3
Pine sap, 166
Pinnacle Peak, 114–15
Pintail, 272–3
Pinus albicaulis, 221–3
Pinus contorta, 223–4
Pinus monticola, 214–15
Piper, Charles V., assistance in flora of Mount Rainier National Park, 135
Pipilo maculatus oregonus, 311
Pipit, 317
Pipsissewa, 167
Piranga ludoviciana, 312
Point, or Peak, Success, 6, 8, 42, 43, 74, 77
Polemonium, 183, 190
Polemonium elegans, 190
Polemonium humile, 183
Polygonum bistortoides, 139–40
Polypodium hesperium, 198
Polypodium occidentale, 196
Polystichum lonchitis, 198
Polystictum munitum, 193
Populus trichocarpa, 229–30
Portland, Oregon, 27
Potentilla, 173
Potentilla flabellifolia, 173
Princess pine, 167
Procyon lotor pacifica, 244–5
Protococcus nivalis, 49
Pseudotsuga taxifolia, 209–10
Ptarmigan, white-tailed, 278–9
Pteridium aquilinum pubescens, 192–3
Pterospora andromedea, 166
Puget Sound, 3, 4, 12, 32, 51
Pulsatilla occidentalis, 138–9
Puyallup Glacier, 11, 40–1
Pyramid Glacier, 12, 43
Pyramid Rock, 43
Pyrola, 166–7
Pyrola bracteata, 166–7
Pyrus occidentalis, 150
Pyrus sitchensis, 143

Q

Quail, California, 279–80

R

Rabbit, rock, 258–9
Rabbit, snowshoe, 257–8
Raccoon, 244–5
Rainier, Rear Admiral Peter, the mountain named after, 51
Rainier, Mount, general description of, 3–9; recent volcanic eruptions of, 7; its glaciers, 10–49; Captain George Van-

Rainer, Mount—*Continued*
couver the first white man to see, 50; named by Vancouver after Rear Admiral Peter Rainier, 51; first close approaches to, 51–2; first attempt to scale the mountain by Lieut. A. V. Kautz, 52–61; first successful ascent of, by Stevens and Van Trump, 61–77; the name Takhoma as applied to, 77; Indians of the vicinity of the mountain, 79 ff.; location of, 88; geological development of the region of, 91–2; notes on the ascent of, 107–12; life zones on, 129–34; climatic conditions about base of, 199; winter on the mountain, 341 ff.; winter sports, 346 ff.
Rainier National Forest, 89, 90
Rainier National Park, Mount, *see* Mount Rainier National Park
Rampart Ridge Trail, 119
Rangers, National Park, 88–9
Ranunculus suksdorfii, 174, 180
Rat, brown, 260
Rat, water, 262–3
Rat, wood, pack, or trade, 259–60
Rattus norvegicus, 260
Raven, American, 300
"Red snow," 49
Reflection Lakes, 77, 114, 115
Regulus calendula, 323–4
Regulus satrapa olivaceus, 323
Rhododendron, white, 146
Rhododendron albiflorum, 146
Ribes acerifolium, 191
Ribes sanguineum, 164
Ricksecker, Eugene, 79
Rivers of Mount Rainier National Park, fluctuation in volume of, 28
Roads to and in Mount Rainier National Park, 94–8
Robin, western, 326
Rocky Mountains, glaciers in, 10
Rubus nivalis, 158
Rubus pedatus, 149
Rubus spectabilis, 171
Russell, Prof. Israel C., 38, 78
Russell Glacier, 12, 38

S

Sable, American, 245–6
St. Helens, Mount, 3, 5
Salal, 146–7, 161–2
Salamanders, 266
Salmo clarkii, 333–4
Salmo gairdneri, 337–8
Salmo lewisi, 338–9
Salmo shasta, 336–7
Salmon berry, 171
Salvelinus fontinalis, 334–5
Salvelinus malma, 335–6
Sambucus callicarpa, 144
Sambucus melanocarpa, 144
Sandpiper, semipalmated, 275
Sandpiper, spotted, 275–6
Sandpiper, western solitary, 274–5
Sapsucker, northern red-breasted, 291
Sarvent Glaciers, 30–1
Saxifraga bronchialis, 144–5, 150
Saxifraga cespitosa, 151
Saxifraga tolmiei, 150, 151
Saxifrage, 144–5, 150, 151
Saxifrage, Tolmie, 150, 151
Scapanus sp., 264
Sciurus douglasi, 253
Scolecophagus cyanocephalus, 302–3
Seattle, Wash., 4, 88, 96
Seattle Park, 38
Sedum, 181
Sedum divergens, 181
Selasphorus rufus, 295
Senecio triangularis, 176
Sewellel, 251
Shasta, Mount, 3
Shooting star, 156, 168–9
Shrews, 264–5
Shrikes, white-rumped, 313–14
Sialia arctica, 328
Sialia mexicana occidentalis, 327–8
Sierra Nevada, glaciers in, 10; formed by erosion, 91
Silene, Suksdorf, 144, 159
Silene Suksdorfii, 144, 159
Siskin, pine, 306
Sitta canadensis, 321
Sitta carolinensis oculeata, 320–1
Skiing, 347, 349–51
Skunk, little spotted, 250
Skunk cabbage, 179

Skyline Pony Trail, 113, 115–16
Sluiskin, Indian guide of Stevens and Van Trump, 62, 63, 64, 67, 68, 69, 77, 82
Sluiskin Falls, 117
Sluiskin Mountains, 92, 93
Smartweed, 139–40
Smelling leaf, 150
Smelowskia ovalsi, 181
Snake, garter, 266
Snipe, Wilson or jack, 276
Snowfall, heavier at base of mountains than at top, 20; depth of, at Longmire Springs, 21; at Paradise Park, 21; in Mount Rainier National Park, 352, 353
Snowflake, 306–7
Snowshoeing, 347, 348–9
Solitaire, Townsend, 324–5
Sorbus occidentalis, 230
Sorbus sitchensis, 143
Sorex sp., 264–5
Sorrel, Oregon wood, 165
Sourdough Mountain, 93
South Mowich Glacier, 11, 40
South Tahoma Glacier, 11, 42–3
Sparrow, fox, 310–11
Sparrow, Gambel, 307–8
Sparrow, golden-crowned, 308
Sparrow, Lincoln, 310
Sparrow, rusty song, 309–10
Sparrow, western chipping, 308
Sparrow, western savanna, 307
Speedwell, alpine, 184, 186–7
Speedwell, Cussick's, 184
Sphyrapicus ruber notkensis, 291
Spilogale putorius, 250
Spinus pinus, 306
Spiræa, Alaska, 142–3, 176
Spiræa, rosy, 157–8, 170, 172
Spiræa densiflora, 157–8, 170, 172
Spizella socialis arizonæ, 308
Sports, winter, on Mount Rainier, 346 ff.
Spraguea, 172–3
Spraguea multiceps, 172–3
Spray Park, 8, 35
Spring beauty, 160
Springtails, 48
Spruce, Sitka, 225–6
Squaw grass, 140–1, 151
Squirrel, Columbia mantled ground, 254–5
Squirrel, Douglas, 253
Squirrel, flying, 254
Starbo Camp, 124
Steamboat Prow, 32
Stellula calliope, 295–6
Stevens, General Hazard, and P. B. Van Trump, account of first successful ascent of Mount Rainier by, 61–77; description of Indians and their life, 81–2
Stevens Glacier, 23
Stonecrop, 181
Straw flower, 141–2
Struthiopteris spicant, 193–4
Sturnella magna neglecta, 302
Success Glacier, 44
Summerland, 30, 123
Sunset Amphitheater, 40, 41
Swallow, northern violet-green, 313
Swallow, tree, 312
Sweet-after-death, 150
Swift, Veaux, 294–5
Switchback Trail, 116
Syrnium occidentale caurinum, 286

T

Tachycineta bicolor, 312
Tachycineta thalassina lepida, 313
Tacoma, Wash., 4, 88, 94, 96
Tahoma, Little, 7; glaciers on, 29 ff; 93
Tahoma Glacier, 11, 41–2
Takhoma, the Indian name as applied to Mount Rainier, 78
Tanager, western, 312
Tatoosh Creek, 77
Tatoosh Range, 4, 46, 47, 92
Taxus brevifolia, 226–7
Taylor, William P., material on animals of Mount Rainier National Park, 231 ff.; birds listed by, 267 ff.
Temperatures in Mount Rainier National Park, winter, 352
Thomomys douglasii shawi, 256
Thrush, Alaska hermit, 325–6
Thrush, russet-backed, 325
Thrush, varied, 326–7
Thryomanes bewickii calophonus, 319
Thuja plicata, 210–12

Thysanura, 48
Toads, 266
Tobogganing, 347, 351
Tolmie, Dr. William Fraser, first close approach to the mountain by, 51–2; botanical work on Mount Rainier, 136
Towhee, Oregon, 311
Trail of the Shadows, 119–20
Trails in Mount Rainier National Park, 98 ff.
Transition life zone on Mount Rainier, 131
Trees, ages and dimensions of, 206; natural rotation of species, 207–9
Trees of Mount Rainier National Park, 199–230
Trillium, 148–9
Trillium ovatum, 148–9
Troglodytes aëdon parkmanii, 318
Trout, black-spotted, 338–9
Trout, Cutthroat, 333–4
Trout, Dolly Varden, 335–6
Trout, eastern brook, 334–5
Trout, rainbow, 336–7
Trout, silver, 339
Trout, steelhead, 337–8
Tsuga heterophylla, 212–14
Tsuga mertensiana, 220–1
Turtleshead, 170
Twin flower, 161

U

Ursus americanus, 238–9

V

Vaccinium deliciosum, 158
Vaccinium macrophyllum, 162–3
Vaccinium ovalifolium, 163
Vaccinium parvifolium, 163–4
Valerian, 139, 160
Valeriana sitchensis, 139, 160
Valley Trail, 114, 116
Van Trump, P. B., 44; with General Hazard Stevens in first successful ascent of Mount Rainier, 61–77
Van Trump Glacier, 12, 44–5
Van Trump Park, 44, 45, 118–19
Vancouver, Captain George, first white man to see Mount Rainier, 50; names it after Rear Admiral Peter Rainier, 51
Vanilla leaf, 150
Veratrum viride, 144, 190
Veronica alpina, 184, 186–7
Veronica cusickii, 184
Viola retroscabra, 186
Viola sempervirens, 186
Viola sp., 175
Violet, blue, 186
Violet, dog, 186
Violet, dog-tooth, 137–8
Violet, yellow, 175
Vireo, warbling, 314
Vireo gilvus, 314
Virginia bluebell, 182
Volcanic eruptions of Mount Rainier, recent, 7
Vulpes cascadensis, 242–3

W

Wake-robin, 148–9
Wapiti, 236–7
Warbler, Audubon, 315
Warbler, lutescent, 314–15
Warbler, pileolated, 316–17
Warbler, Tolmie, 316
Warbler, Townsend, 316
Warbler, Yellow, 315
Waxwing, cedar, 313
Weasel, least, 249–50
Weasel, Washington, 249
"Wedge, the," 12, 32
West Side Trail, 119
Whistler, 243–4
White River, 30, 32
White River Camp, 121
White River district, fishes in, 331–2
Whitman Glacier, 29
Wild cat, 240–1
Wild ginger, 165–6
Wild parsley, 143
Wild parsnip, 143
Willis, Prof. Bailey, 35, 78
Willis Wall, 35–6
Willow, alpine, 230
Willow herb, 145
Willows, dwarfed (*Salix*), 230
Wilsonia pusilla pileolata, 316–17
Wind flower, 138–9

Winter on Mount Rainier, 341 ff.
Wintergreen, 166–7
Winthrop, Theodore, 32
Winthrop Glacier, 11, 32–5
Wolf, prairie, 242
Wolf, timber or gray, 241
Wolverine, 247
Wonderland Trail, 99–107
Woodpecker, Alaska three-toed, 290–1
Woodpecker, Gairdner, 290
Woodpecker, Harris, 289–90
Woodpecker, Lewis, 292–3
Woodpecker, northern pileated, 291–2
Wow, Mount (Goat Mountain), 4, 92
Wren, northwest Bewick, 319
Wren, Parkman or Pacific house, 318
Wren, western winter, 319–20

X

Xerophyllum tenax, 140–1, 151

Y

Yakima Park Trail, 121–2
Yarrow, western, 145–6
Yellowstone National Park, 7
Yew, western or Oregon, 226–7

Z

Zamelodia melanocephala, 311–12
Zapus trinotatus trinotatus, 262
Zonotrichia coronata, 308
Zonotrichia leucophrys gambelii, 307–8

A Selection from the Catalogue of

G. P. PUTNAM'S SONS

Complete Catalogues sent on application

Handbook of Yosemite National Park

By

Ansel F. Hall

U. S. National Park Service

Much has been written of "The Valley Incomparable," and the 1100 square miles of Scenic High Sierra which have been set aside as a playground for the people.

But there still remains the task of satisfying the thousands who seek definite information concerning its history, ethnology, botany, geology, camp- and trail-craft, natural history, and related subjects. No one man can be master of all these branches of knowledge, so the author presents this collection of articles each by an eminent authority.

G. P. Putnam's Sons

New York London

Let 'Er Buck

By

Charles Wellington Furlong

Here is the story of the passing of the Old West, remarkably illustrated from photographs of bucking horses, cow-pony races, roping wild steers, bulldogging Texas longhorns, Indians, cowboys, and old-time scouts as seen at the famous annual cowboy carnival, the Round-Up, held in Pendleton, Oregon, each September. "Let 'Er Buck" will delight every American who loves out-of-door life and real sportsmanship.

G. P. Putnam's Sons

New York London

In the Oregon Country

Outdoors in Oregon and Washington, together with Some Folk-Lore and the Modern West in the Making

By

George Palmer Putnam

Author of "The Southland of North America," etc.

As the title indicates, the author in his pilgrimages was concerned chiefly with the attractions of the Open, which he chronicles with the enthusiasm of a devotee. There are descriptions of trips along the forest and mountain trails, on foot and horseback; and with gun, rod and camera; of the ascent of peaks and of long canoe excursions, all replete with incidents of interest and rich in word-pictures of the glorious country traversed. Picturesque Indian legends are retold, while the developments of to-day and features of modern pioneering are sketched in, so that the reader gains acquaintance with many phases of the West, its peoples, and its natural attractions.

G. P. Putnam's Sons

New York London

On the Trail in Yellowstone

By

Wallace Smith

With 23 illustrations by the Author

A casual notebook containing numerous delightful sketches of a packhorse trip in the Yellowstone country. Mr. Smith is a born "tramp" and his book will delight everyone who has caught a fish or followed the trails that lead away from civilization into the mountains.

G. P. Putnam's Sons

New York London

Santa Clara Coun
Free Library
San Jose, Cali

MOUNT RAINIER, around which this book is written, is a study in contrasts. Many ages ago a roaring volcano that belched forth fire and molten lava, it is now silent, and ice covered; and on its summit, pouring down its sides in mighty rivers of ice, is the most complicated, largest and most beautiful single peak glacier system in the United States. Mr. Schmoe, who is the Park Naturalist at Mount Rainier, has spent much time and effort in studying the hoary old mountain and its surrounding wild life. The study of this book will unquestionably add much to one's knowledge of Mount Rainier National Park and to the enjoyment of a visit to this vast scenic playground which is literally a gigantic out-door museum.